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THE CHARGE OF THE LIGHTNING SENDER.

Up from his desk, the other day,
A "plug" arose in some dismay,
To answer a call from a distant town
On a wire difficult to hold down.
The office was warm, the hour was late,
As that sender started at rapid rate,
And soon he was going like the wind,
And the plug was fifteen words behind.

And faster and faster the dashes rolled,
And the dots, like a torrent uncontrolled,
Till through the office seemed to pour
Some sixty words a minute or more.
And there, in the dim and waning light,
Driving his pen with all his might,
With lips compressed, to his desk inclined,
Sat the poor plug twenty words behind.

Then swift from his pen the words they flowed,
Like chicken tracks in a muddy road,
And as he thought of his terrible need,
He scratched away at the utmost speed.
But soon on his face came a pleasant smile,
For he had caught on to the sender's style,
And as dots and dashes came to his mind,
He was soon not more than ten words behind.

Onward, still onward, at steady pace,
The plug was surely winning the race;
And when a long special neared its end,
He knew quite well how that sender could send.
Sometimes ahead, sometimes in the rear,
At last every word to him came clear,
And when he got through—please bear it in mind—
The *sender* was fifteen words behind!

Electric Lighting.—XVIII.

THE VOLTAIC ARC (CONTINUED).

It is an important fact that with the same current the light of the arc is more intense with smaller carbons than with larger ones; the arc then appears to be a little shorter, but it is more dense and does not so much exhibit that tendency to move and shift, and consequently the light is more brilliant and more uniform. Of course, when the carbons are smaller they consume more rapidly, and that is the only drawback which prevents the more general use of small carbons. In practice it is desirable that the lamps should burn several hours without requiring a change of carbons, and for this reason electricians use carbons that are larger and which will last longer. Even if the negative carbon alone were made smaller it would improve the light of the arc. The positive carbon always burns faster than the negative, so that the use of a smaller carbon for the negative would only tend to equalize the rate of consumption in both the positive and the negative carbons. But there seems to be some objections to this method of doing, in practice also, for it has not been adopted to any great extent, in spite of the known advantages it possesses. These objections are indeed of some importance; in the first place, if the negative carbon consumed at an equal rate with the positive carbon, the length of the frame of the lamp would require to be greater so as to accommodate a longer negative carbon, and this would render the lamp much more cumbrous; in the second place there is the inconvenience of using two sizes of carbon, and the waste which results from it. This is the reason why different sized carbons are seldom used; for instance, if the lamp were used long enough each time to burn a little more than half of each carbon, then new carbons would have to be substituted every day, and the pieces would be wasted; but on the other hand, when both carbons are of the same size, so that the positive consumes faster, the portion of the positive which would remain would suffice to make them serve as negative carbons, and thus by burning a carbon first as positive and then as negative, with a new one for positive, the amount wasted is very slight. In practice, the negative carbon is almost always furnished by the "stumps" left from carbons that have been burned as positive, unless the lamp is used so many hours at a time that the positive carbon is nearly all consumed, in which case it is necessary to replenish the negative with new carbons when it is all burned. This improvement in the light with smaller carbons seems to be due to the character of the crater; indeed, the shape and size of the crater are the guides by which the size of carbons to be used with a given current is selected. There is an undoubted connection between a good light and a good crater; the more symmetrical and true the crater is, in all cases, the better the light that is produced. By a true crater we mean one that is perfectly round, and whose cavity is of uniform cup shape, without ridges or grooves in the bottom or on the sides; as a rule, a good crater inclines to be smaller than a poor one, and its diameter in the ordinary circuit arc light is seldom greater than two and a half or three millimetres, and its depth scarcely more than one to two millimetres. When the crater is not evenly deep and shows grooves and crevices around its bottom, it is usually larger, though shallower; in this condition it presents the appearance of having been produced by several successive changes of "focus," as if the action had become shifted from point to point, and it is these

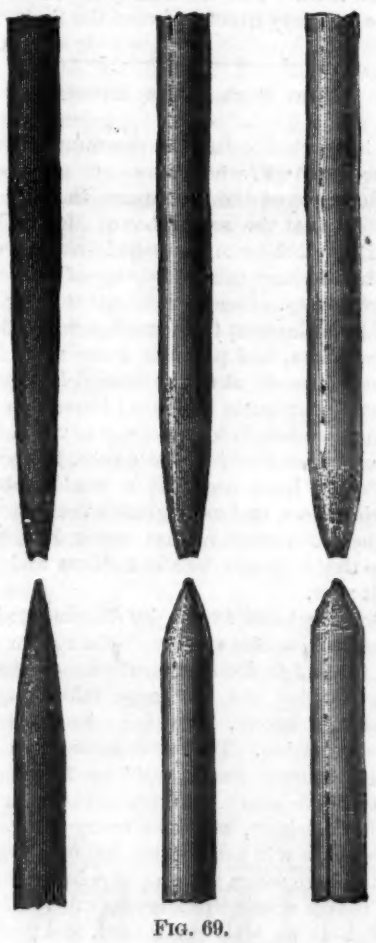

FIG. 69.

several "facets" that make it seem unsymmetrical. In point of fact, each of the facets indicate a change of the action. If we watch an arc light for a few minutes, specially one that is covered with a ground glass globe, we will notice this motion of the arc as it shifts from one point to the other; the light seems to oscillate or roll around from side to side. This phenomenon may often be noticed in some of the Brush lights on our street circuits. It may be said in reference to it that it is more apt to occur when the current producing the arc is of small volume, say 10 ampères, or less, like the Brush current. The phenomenon of itself shows that the carbons are too large for the current; the current is not sufficiently powerful to use up the whole of the point at once, and so it burns in sections, so to speak. The remedy is evidently to decrease the size of the carbons. However, it is well to remark that the same phenomenon may also be due to a different cause, namely, the faulty construction of the lamp. It is clear that if the rod which carries the upper (positive) carbon works too loosely, it will be apt to move laterally to and fro and throw the carbon which it carries more or less out of line; the swing of the lamp, by the action of the wind or the motion of the parts in feeding, may suffice to cause this little oscillation, which is yet enough to make the arc shift its crater at the positive pole. The arc, as we know, is produced between the crater and the point of the negative carbon, and its length is measured by the distance from the bottom of the crater to the tip of the negative carbon. Now, if the arc is rather short, say 1 millimetre, the tip of the negative carbon may be inside the circular opening of the crater, and in this case it is evident that the slightest shifting motion or oscillation sidewise would make the action concentrate itself on a side of the cavity of the crater, and cause the production of a facet in it. It is evident therefore that the motion of the carbon carrier ought not to be too free, but that on the contrary it should be as true and accurate as possible.

While it may be advisable to use small carbons it is not expedient or practical to attempt the use of carbons that are too small. We have already noted that the carbons always become heated for a greater or less portion of their length near the arc. This takes place to a more considerable extent on the positive carbon, which is always found red hot for a certain portion of its length, as may be noticed more readily when the current is cut off from the lamp. Now, while they are thus red hot, the carbons slowly consume at their surface, by the action of the oxygen of the air; the effect of this combustion is to reduce the size of the carbons by a more or less considerable portion, and as the effect increases as we approach the arc, the diameter of the carbons there is still more reduced. It is for this reason that the carbons begin to taper at such a distance from the arc, and it is also because the positive carbon is hotter for a greater distance that it is tapered more than the negative, as shown in Fig. 69, where the upper carbons represent the positive ones, the lower, the negative carbons. We have alluded to the fact that a conductor should have sufficient capacity to convey the currents passing through, and that when this carrying capacity is too little for the current heat is produced by the passage of the current. This is another argument against the use of too small carbons; their tendency to heat red hot is increased considerably, and the slow combustion on their surface begins further away from the arc. This combustion is useless so far as benefit in producing light is concerned; it merely produces a waste of carbon which reduces their size still more, and causes them to wear faster yet in the arc. It is only near and in the arc that the combustion of the carbon is of benefit in producing light: the carbon is white hot here, it will be recollected, and the action of the oxygen tends to keep the heat at that degree, and thus it helps the general result.

As already intimated, the size of carbons to be used is governed by the volume of current used. Thus, with a current of very small volume—say 5 or 6 ampères—the carbons should not be larger than $\frac{3}{8}$ inch, and might be smaller with benefit, especially if plated, as will be shown further; with a current of from 10 to 15 ampères, a carbon of $\frac{3}{8}$ inch would be as small as could be used without undue heating, and it would be advisable to use rather larger ones—say $\frac{7}{16}$ inch or $\frac{1}{2}$ inch. The current, which is used for ordinary circuit lights, ranges in different systems from 10 to 25 ampères, seldom being outside of these limits; and consequently the sizes of carbon just mentioned are those mostly used. With single light machines, however, the current maintained in the circuit reaches much higher limits, it being in some cases as high as 50 ampères. With such powerful currents the carbons ordinarily used would become red hot for several inches; the sizes used vary between $\frac{1}{2}$ inch and 1 inch.

A very effectual and practical method of diminishing the undue heating of carbons, and their useless combustion and too great tapering, is that of electroplating them with copper. Only a very thin coating is required; indeed, it is found that when the coating is too thick it reacts unfavorably on the light. The effect of plating the carbons on their manner of burning is plainly perceptible in Fig. 69. The left-hand carbons are plain, the middle ones are plated with copper, the right hand ones are plated with nickel. It is easily seen that with copper-plated carbons the points are much shorter than with plain carbons; and with nickel-plated carbons they are yet shorter. The true office of this coating of metal is undoubtedly to protect

the carbon from the action of the air. These metals are not very oxidizable, as we know, and they only fuse at a high heat, so that they remain intact until they have come quite near the arc, where the heat is sufficient to vaporize them. The fact that nickel fuses at a higher temperature than copper doubtless accounts for the still greater shortness of the points in the carbons covered with nickel, for it protects the carbon from the air until it comes nearer the arc, only because it can withstand a higher heat before fusing than copper can. The positive (upper) carbon has a point tapering at a very good angle; but the angle of the negative carbon is too obtuse. It would intercept too much of the light reflected from the positive crater. The negative copper-plated carbon has a more tapering point, which is more suitable. The carbons consume very much slower when they are plated with copper than when they are plain, and their consumption is still less when plated with nickel. According to experiments made by M. Reynier, Oct. 10, 1875 (the earliest that are known, the practical application of electro plate coverings to carbons having been introduced by him), the comparative consumption per hour of these carbons, one plain, one coppered, one nickled, was 166, 146, 106 millimetres for the positive carbons, and 68, 40, 38 millimetres for the negative carbons. There would seem to be a material advantage in the use of nickel for plating the carbons; however, the extra cost and the difficulty of depositing nickel has led to the almost universal use of copper. None of the other metals appear to be adapted to the purpose so well as copper or nickel.

The conductivity of the carbon appears to be materially increased by electroplating them; it is found that a plated carbon of given size can be used satisfactorily in place of a plain carbon of the next larger size, the heat being no greater and the consumption being nearly the same. However, the light produced from plated carbons is not quite as steady and uniform as the light produced from plain ones. This should be well borne in mind, for in many installations, especially in-door, it may be found advantageous to use plain carbons altogether.

Considerable discussion has arisen as to the priority of the invention of plating the carbons. The introduction of the process in practice is undoubtedly due to M. Reynier, who for a long time was supposed to be the first inventor. It is now known, however, that M. Carré, the celebrated French carbon manufacturer, was the first to think of electroplating carbons, though he plated them only with tin or zinc. This was in 1867. M. Reynier's patent dated Oct. 11, 1875. Brush obtained a patent in this country on the process of plating carbons with copper in 1878. It has transpired since that M. Bouliguine, of the Russian navy, made some successful experiments on electroplating carbons with copper in 1878, and that another engineer, M. Tchikoleff, of the Russian army, was also at work in the same direction about the same time.

ELECTRICAL PROPERTIES OF THE VOLTAIC ARC.

We have already stated that the incandescent vapors in the arc serve as the medium of conveyance for the current, therefore we may consider the arc as a part of the general circuit. It is in reality a conductor, and it opposes the passage of currents through it with a certain resistance. This resistance is two-fold: passive resistance, or true resistance, which depends on the nature of the substances composing it, and active resistance, which is an opposition produced by the use of a counter electromotive force in the arc, which reacts against the electromotive force of the current in a manner analogous to the Lenz effects.

Much diversity of opinion appears to exist as to the resistance of the voltaic arc. Thus we find it variously estimated from ½ ohm to 3 ohms by Profs. Houston and Thomson, 4½ ohms by Brush, 5 ohms by Sir Wm. Thomson, from 12 to 30 by Profs. Ayrton and Perry, and from 30 to 40 by du Moncel. The fact is that the resistance of the arc depends altogether on the conditions attending the production of the arc. The electromotive force of the source of current possibly may play a part in these variations. Profs. Ayrton and Perry found that with an electromotive force of 108 volts the arc had a resistance of 12 ohms, while when the electromotive force reached 144 volts the resistance increased to 20 ohms. With an electromotive force of 219 volts the resistance of the arc was 30 ohms. Still, it may be that the electromotive force only reacts on the resistance of the arc in so far as it makes the strength of current vary; indeed, this is quite probable, and it seems to be verified by the observations of several physicists. The true theory, therefore, would be to suppose the resistance of the arc to vary as the strength or volume of current, and when we recollect that the heat developed in the arc must also vary with the power of the current, it seems plausible that the variations of resistance must depend on the current. Professors Houston and Thomson found that with a current of 10 ampères the resistance was 2.77 ohms, while with a current of 16.5 ampères it fell to 1.25 and with a current of 30.12 ampères it fell down to .54 ohms.

The observations of M. Edlund also confirm these results. He has shown that the resistance varies inversely as the strength of current used. He divides the resistance of the arc into two portions, for he finds that it is governed by two causes, which are distinct. Thus he states that the greatest proportion of this resistance is a constant that depends on the strength of the current as already stated, but which is independent of the length of the arc. This statement is, therefore, greatly at variance with the generally accepted belief, for it is generally supposed by electricians that the resistance of the arc increases directly as its length. According to M. Edlund, the proportion of the resistance which increases proportionally with the length of the arc is quite small, and represents a small percentage of the total resistance of the arc; he finds, moreover, that even this portion diminishes with an increase of the strength of current. We shall find further on when we come to the consideration of arc regulators that it is on this variation of the resistance of the arc with its length that we depend for a means of keeping the arc of a constant length. Suppose, for instance, that the current divides at the arc; a portion of it goes through the arc as before, while another passes through a branch circuit connected to both carbons. Now, according to Ohm's law, the current in each of these two paths will be inversely proportional to their resistances. If the resistance of the by-path around the arc, or the "shunt," as it is called, is 99 times greater than that of the arc itself, it will receive only $\frac{1}{100}$ of the current, and the rest of the current, or $\frac{99}{100}$, will pass through the arc. Now suppose the resistance of the arc to increase as it becomes longer by the consumption of the carbons, then the "shunt" will receive more than $\frac{1}{100}$ of the current and the arc will receive less than its $\frac{99}{100}$; now if this shunt wire is made into a helix and serves as an electro-magnet, it may be adjusted and balanced in its action with such nicety that the moment it receives the slightest amount of current above its share, its action will be increased enough to operate the feeding mechanism and cause the carbons to approach. This is the theory of regulators of all types that are intended to be worked in series on a circuit of several lights.

The resistance of the arc probably varies, as a whole, also with the size of carbons used, for the volume of the heated vapor in the flame varies with the size of the carbons. With currents of great volume the resistance of the arc is not always necessarily less than with smaller currents, for its length and the density of the vapors which serve as conducting medium for the current must change with the size of carbon used. The resistance of the ordinary circuit arc does not vary much between the limits of 4 and 5 ohms.

C. O. M.

How High is the Aurora?

We print in another column a communication received from a correspondent, who comments adversely upon a remark made in our editorial columns, in the issue of Jan. 13, to the effect that the researches of Messrs. Warren de la Rue and Hugo Müller on electrical discharges in vacua were likely to increase our knowledge of the nature and height of the aurora. Our correspondent describes a phenomenon of great interest to those engaged in the study of auroral phenomena, and presents some new facts to be added to those already at our command in regard to this interesting subject; but in including Messrs. de la Rue and Müller, by implication, in his category of "would-be scientists," our correspondent is a little rash, to say the least. These gentlemen have acquired a world-wide fame as adept experimenters, and as original investigators the precision of their observations has never had cause to be doubted; so that it would be a hazardous and futile task to impugn it now.

These observers have found by diligent study that the peculiar striated characteristics of the aurora make their appearance in electric discharges when the pressure of the atmosphere in which the discharge takes place is attenuated to a certain degree. That is a scientific fact, susceptible of demonstration. That their application of this fact to the earth's atmosphere is valid we have no reason to doubt. On the contrary, from what we know of the behavior of electricity, we have every reason to believe that the discharge will assume the same character in the earth's atmosphere when the proper point of low pressure is reached, that it would in a vacuum tube. That is a conclusion which is as well warranted, and perhaps better, than many which are looked upon as established facts. We still believe in what we said then, that this "may be a fact that will greatly assist us in ultimately arriving at a plausible theory of the aurora."

In science, facts never conflict with each other; on the contrary, they corroborate and maintain each other. Two given facts may not happen to fit or "jibe" with each other, but that may be due to the way they are brought together; it may be safely asserted that there is a place somewhere in the line for each, where it fits precisely, even though they be far apart.

Our correspondent stands in precisely the same relation with his facts to Messrs. de la Rue and Müller with theirs, They are both right, though in different relations. A learned French writer, M. Alfred Angot, has lately reviewed at considerable length, in *La Lumière Electrique*, the whole state of our knowledge concerning the aurora borealis. In a series of ten articles, with illustrations of the most remarkable auroras, M. Angot tells us all the facts that are known about the aurora. He has consulted all the records and observations made on the subject from the time of Aristotle to our days, and has analyzed all the theories propounded to explain these phenomena. But, though we may not be satisfied to receive any theory of the subject as final, yet the review of the facts gathered from such extensive and authentic sources seems to show one thing clearly—that the phenomena which we designate by the general term "aurora" are varied in cause, as well as in character, and that in this manner we are often calling by the same name things which are vastly different.

M. Angot classifies these into three distinct classes: 1st. Auroras which do not produce or accompany magnetic disturbances. These are mostly limited to the polar regions, and very seldom extend to the mean latitudes. 2d. Auroras which take place over large portions of both hemispheres simultaneously, and which are always accompanied by magnetic disturbances in the entire globe. These have an entirely different origin from the first, and are referable, in all probability, to earth currents and their inductive reaction on the higher strata of the atmosphere. 3d. Phenomena which give rise to purely local luminous manifestations.

The cause of these is still obscure, and a greater number of observations will be necessary to help us to determine their cause.

It is to this last category that the phenomenon observed by our correspondent belongs. M. Angot cites two similar cases: "M. Hildebrand Hildebrandsson, director of the Upal Observatory (Austria), states that on the 25th of July, 1877, two observers saw a clearly defined, transparent mass of red light floating over an inland lake, within six feet of its surface. The margins were wavy, and the mass indisputably moved toward the other side of the lake in the direction of a woodland, a distance of nearly half a mile. The length of this luminous mass must have been about 200 metres. A similar phenomenon was noticed again three times, its duration in each case being about two seconds. M. Hildebrandsson considers this phenomenon as a transition between the aurora and the ordinary electric storm discharge of electricity." The second instance is quoted from Arago's works (Vol. iv., p. 146): "Major Sabine and Captain J. Ross were returning in the fall from their first Arctic expedition; they were still in the Greenland seas, during one of those very dark nights peculiar to these regions, when they were called on deck by the officer on duty, who had just perceived something very strange. In front of the vessel, and precisely in its course, was a stationary light on the sea, which rose to a great height, while all around it both the sky and the horizon seemed pitch dark. There was no known danger in those parts, so the course of the ship was not changed. When the ship penetrated the luminous region the whole crew was silent, watchful and uneasy. Immediately the highest parts of the masts and of the sails, and all the ropes, could be easily perceived in the light. The meteor might have had an extent of 400 metres. When the forward portion of the vessel left this luminous space it immediately found itself in obscurity; no gradual weakening was observable. This luminous region remained in sight for a long time after the ship had left it."

Between these phenomena and the so-called "St. Elmo's fire" there is probably a closely allied connection of some kind; and it is not impossible that they may be both of them some phase of the discharge of electricity by slow diffusion, just as the "brush discharge" which results from a pointed conductor. The crackling sound heard by our correspondent would give additional weight to this supposition.

It is stated by M. Angot that such phenomena are more frequent in the neighborhood of bodies of water; which is also additional evidence in the same direction. It is certain, however, that there is a wide distinction to be made between these local phenomena, which appear to depend on different causes, confined to a narrow district, and those of the first two classes, which might be called true auroras. It is important to know that these auroras never take place in the lower regions of the atmosphere. A connection exists between certain auroras and those high clouds known as "cirrus." It has been observed in several regions, according to M. Angot, that they either accompany or precede the aurora; and they are to be observed the day before or the day following it; moreover the intensity of the phenomenon seems to be shown in the character of the cirrus. Now, it is indisputable that these clouds are situated at enormous heights. Those who have climbed the highest peaks of the Alps and the Himalayas, and æronauts, tell us that they seem to remain apparently as high above them, as at the lower levels. Observations and calculations by scientists give to auroras an estimated height of from 100 to 300 miles. But all methods of triangulation, though they may prove reliable in estimating the distance of a comparatively fixed point like a planet or a star, must be liable to serious errors when applied to such uncertain and changing meteors as the aurora. All agree, however, that the height is very great, and the estimate of Messrs. de la Rue and Müller appears very moderate in comparison with others. If the true aurora ever occurs below that height it cannot be at a great variation. In this respect the conclusions of these two scientists are sustained by the observations of another physicist, Mr. Capron. This observer has remarked that the spectroscope shows no indication of nitrogen in the atmosphere in which the discharge takes place. He has tried a very interesting experiment with a Swan incandescent lamp. In these lamps, as we know, the atmospheric pressure is reduced to a very small

fraction, about one-millionth. Mr. Capron connected one of these lamps to one pole of an induction coil, and placed the other pole against the glass envelope of the lamp, so that the current would perforate the glass. The opening thus produced is extremely minute, so that air would rush into the lamp to fill the vacuum very slowly. On first passing the spark no indications of nitrogen appear in the spectroscope, but in a very short time the air enters in quantity sufficient to show traces of nitrogen. The height of our atmosphere is believed to rise to about fifty miles, but it is extremely probable that the upper strata are composed of only the lightest gases and that the last regions are made up of hydrogen alone, the lightest of all. That the disappearance of nitrogen may occur at a height in the neighborhood of that ascribed by Messrs. de la Rue and Müller to the aurora is not impossible. These facts are of interest, even though we cannot yet base a final theory on them. These observers do not, as our correspondent implies, advance them as the *only* factors, but as important additional ones which can serve to blend with others and lead to higher conclusions.

The Electric Light vs. Gas in London.

Coal in England is about the same price that it is in Detroit, says the Detroit *Free Press* in an article on the above subject, yet gas is very much dearer in America. Wimbledon, a southwestern suburb of London, has just gone back a half century or so and taken to oil lamps rather than pay what it considers the exorbitant price of $1 a thousand feet! The greater part of London pays about seventy-five cents a thousand for gas. The *Free Press* in Detroit pays $2.25 a thousand feet for gas, while the *Free Press* in London pays but seventy cents. In other English towns it is cheaper still. Leeds pays but forty-two cents, while for trade purposes it is supplied for twenty-eight cents a thousand feet. If the electric light can compete with gas at these prices here, it ought to do well in America, where gas is so much dearer. The Edison Electric Light Company, which lights the Holborn Viaduct in London, supplies private consumers at the same rate that they previously paid for gas.

Some interesting experiments have been made in private houses in England with electric lighting. The extensive mansion of Armstrong, the great gun man, has long been lit by electricity, but as he uses water power, the cost is of course much less than where an engine has to be driven. The little town of Godalming, on the line between London and Portsmouth, also uses the electric light, produced by water power both in its streets and in its private houses. Berechurch Hall, to the north of London, is now furnished with the electric light. There are now in Berechurch Hall 200 lamps of eighteen candle-power each. The owner of this hall got estimates for putting in gas and also for putting in electricity. The cost of erecting gas manufactory, putting in pipes, etc., was $6,600. The cost of four dynamo machines, Swan lamps, engine, etc., came to $7,000. Thus the first outlay was greater for electricity than for gas, but the owner finds that he saved money after all, as he figures that the light of 200 lamps burned 1,150 hours per annum is $1,160, while at another country house which he owns he pays $1,000 a year for less than half that amount of light.

Gas people object to these figures, and say that unless the engines are kept running night and day at a very great expense the service can never be as complete as that of gas, for electricity cannot be always on tap, as it were. Besides this, it is claimed that even the incandescent light shows the pulsations of the engine, and therefore the light is ruinous to the eyes. Here the electrical accumulator steps in. The Electrical Power Storage Company (limited) has just opened offices in the "city" for the sale of accumulators. These accumulators seem to be partly rented and partly sold. The purchasers can only use them within a prescribed limit. The company has also the power of periodically inspecting them. The accumulators are composed of sets of cells, the cells being at present of three sizes, one, two and five electrical horse-power. The bill of particulars which this company furnishes is something no uninitiated fellow can find out. There is the resistance in ohms and the discharge in amperes, and all that sort of thing. The cheapest accumulator, which consists of twenty-two cells of one electrical horse-power each, is $390; the most expensive, which has fifty-five cells of five electrical horse-power each, costs $6,875. This is certainly very dear, and if the figures keep at that gas ought to have little to fear, especially as these accumulators are merely the holders of the force—a sort of kerosene oil-can, as it were.

The prices of the little pear-shaped lamp in England are as follows: Edison, from eight to sixteen candle-power, $1.08; thirty-two candle-power, $1.68; the Gatehouse, sixteen candle-power, $1.20; the Lane-Fox, eighteen candle-power, $1.20; the Maxim, fifty candle-power, $1.68; the Swan, from sixteen to twenty candle-power, $1.20; forty and fifty candle-power, $1.44; one hundred candle-power, $1.80; the Woodhouse & Rawson, fifteen and twenty candle-power, ninety-six cents.

Suit to be Brought to Vacate the Mutual Union Charter.

ON Monday last, Feb. 26, Judge Barrett, of the Supreme Court, rendered a decision granting the motion made some time ago by the Attorney-General, at the instance of Mr. Jay Gould and Mr. W. H. Cameron, for leave to bring suit to vacate the charter of the Mutual Union Telegraph Company. The judge says that if the allegations of the complaint as to the illegal increase of its capital from $600,000 to $10,000,000, and that this sum was turned over to the construction contractors for services not worth more than $4,500,000, are true the company's charter should certainly be annulled and the Attorney-General would be derelict in his duty if he failed to proceed. With the motives of those making the complaint the Attorney-General has nothing to do. If he should refuse to vindicate the laws of the State until informed of their violation by some person devoid of personal interest, the most flagrant abuses would frequently pass unnoticed. The people should be permitted to bring the action, not because the relators request it, but because the facts justify and the public interests demand it. This decision is likely to lead to some curious results. In the recent agreement between the Western Union and Mutual Union companies it was stipulated that the proceedings to annul the charter begun by Mr. Gould should be discontinued. But Judge Barrett remarks that it is the business of the Attorney-General to prosecute the suit, and that he will be derelict in his duty if he fails to do so. Such is the opinion of Judge Barrett. When Attorney-General Russell was asked what steps he would take after the decision of Judge Barrett, he said that he knew of no course to pursue except to commence the suit. He did not begin the action in view of any controversy between the Mutual Union and Western Union, and he did not see how their settlement made any difference with the question in point. The Mutual Union had been told that if it gave up its organization that was all the Attorney-General cared for. If the company recognized the force of Judge Barrett's decision, and gave up its corporate existence, that would be an end of the matter. The interest of the State was not to injure the property of the company, which it had no idea of confiscating, but to vindicate the law. The application, in which Mr. Josiah C. Reiff remained as the plaintiff, to bring an action to annul the charter of the Western Union, had been held in abeyance, the Attorney-General said, to see what the interests of the people were in the tax suits against that company. The disappearance of the other parties in the application in no way affected the interests of Mr. Reiff. Action would be taken at once in the tax cases, and immediately upon the disposition of them the application would be disposed of. Mr. John G. Moore, the president of the Mutual Union, said that the decision of Judge Barrett granting the application to bring suit to annul the charter of the corporation would not interfere with the lease of its lines to the Western Union Company. The property would remain if the charter were annulled. The rental in the shape of dividends on the stock, interest on the bonds, etc., was to be paid to the stock and bondholders of the Mutual Union, or successor company. The aggregate amount which should be paid was stipulated, and a reorganization could be effected. If the stock should be reduced, the dividends would be increased proportionately, so nothing would be lost by the holders of the securities. The wording of the lease itself provided for such a contingency.

Dr. Norvin Green, the president of the Western Union, being asked for his views, said that he did not regard the opinion of Judge Barrett as a serious matter. By a reorganization of the Mutual Union, in the event that its charter should be declared invalid, the arrangement between the two companies would be unimpaired.

In the meantime what will be the outcome of the matter is hard to tell, but the result promises to be an interesting muddle.

General Hazen Upheld.

At Washington, on the 21st ult., the House of Representatives being in committee of the whole on the Sundry Civil Appropriation bill, Mr. Beltzhoover moved to amend by striking out the clause authorizing the Secretary of War to detail for service in the Signal Corps not to exceed eight commissioned officers, exclusive of the Second Lieutenants of the Signal Corps authorized by law. In advocating this amendment Mr. Beltzhoover made an attack upon the administration of the Signal Service under Gen. Hazen. He believed that this bureau was purely a civil institution and wholly unmilitary, and that it should be transferred to some civil department of the Government, and especially that it should be placed under the charge of a head who had some scientific knowledge and some standing and reputation among the responsible scientists of the country. The speech which he had printed some time ago in the *Record* had been criticised because it had not been delivered on the floor of the House. In order to avoid any misunderstanding he had formulated his statements in a brief form.

Mr. Beltzhoover then read his charges in brief, some of them being well taken, while others were of a purely personal nature, both irrelevant and cruel.

Mr. Beltzhoover's amendment was lost.

The Injunction Set Aside.

THE INCREASE OF WESTERN UNION STOCK DECLARED LEGAL—THE DIRECTORS RESPONSIBLE FOR THE $15,000,00 IF THE STOCK HAS BEEN ILLEGALLY DISTRIBUTED.

In the Supreme Court, Chambers, in this city, on Wednesday last, Judge Ingraham rendered a decision in which he denies the motion to continue the temporary injunction recently obtained by W. S. Williams, restraining the Western Union Company from allowing any of the $15,526,590 of stock of the company issued at the time of the absorption of the American Union to be transferred on its books. Judge Ingraham says that the General Term, as he understood it, decided that the increase of the capital stock to $80,000,000 was legal, but that the distribution of the $15,000,000 of stock among the shareholders of the company was illegal.

He adds that the directors of the Western Union Company must be considered under the statute as liable to the company for full par value of the stock, if they have distributed it without consideration. This liability is imposed by the statute as a penalty for violating the statute which provides that the stock of a corporation shall not be issued except for value. If, therefore, the plaintiff should succeed in his action, the directors must be adjudged to owe the Western Union Company $15,000,000, and the stock which they had wrongfully distributed would be regarded as fully paid, and therefore valid stock. It thus appearing that the plaintiff would not be entitled to a judgment cancelling the stock illegally issued, it would not be proper for the Court to grant a preliminary injunction restraining the transfer of the stock during the pendency of the action. Judge Ingraham also holds that the proper parties are not before the Court to declare the stock issued invalid, as it appeared that a large portion of it had been transferred to innocent purchasers who are not parties to the action.

There Are a Few in the Electrical Business.

Some men have queer notions of newspapers. Good, reputable and even modest citizens, who could not be hired to go into a shoe shop and beg a pair of shoes, or a dry-goods store and ask the proprietor to give them a dress pattern, will enter a newspaper office and coolly request the proprietors to give them a few dollars' worth of advertising. Not in the advertising columns! O! bless your soul, they have too much self-respect for that! What they want is the most valuable part of the paper—the reading columns. They don't call it advertising; perhaps they never are really conscious of what they ask. They probably deceive themselves and so undertake to deceive the editor. The advertisement is disguised under the name of a "news item," or "an item of interest which your readers would like to see." It proves to be some sort of reference to themselves or their business affairs, the publication of which will inure to their private advantage and, except as advertisement, is of no interest to the public whatever. When it is delicately hinted that it is "business," the item which they took pains to bring all the way to the newspaper office proves to be "not of the slightest importance to them;" not "worth a cent" to them. They thought "the public would like to see it," and that the editor "would be glad to get items of public interest." Then they depart, pitying the want of enterprise and the narrow ideas of a newspaper proprietor who cannot tell an "item of news" from an advertisement.—*Detroit Free Press.*

Curious Effect of Frictional Electricity.

The *Paper Trade World* says: "We looked into the press-room of one of Boston's large printing establishments this week. The foreman was furious and the proprietor sorrowful. Frictional electricity in the printed sheets of paper as they left the press was the immediate cause of their trouble. It is an interesting and not uncommon phenomenon, and is not easily explained nor easily controlled. It has puzzled Professors Bell and Wadman, and the best electricians we have about here. The packing upon the press cylinder seems to act as an inductor, and the paper leaves the press thoroughly electrified. We watched a press running off 1,700 an hour. Suddenly the printed sheet clung about the cylinder as though pasted upon it, and had to be torn off in strips. Again, we lifted a few freshly-printed leaves, and they ripped and crackled like the stitches in an old coat. Then we saw a lot of cardboard being printed. The sheets were stuck together as solid as a brick, and could not be separated until the electricity had partly passed off. A piece of printer's brass rule placed in this pile of cardboard, with an end projecting, threw off sparks when approached within an inch by another piece of rule. Two sheets sucked together when held fourteen inches apart. Wet rags placed around the delivery table and led into a bucket of water charged the water with electricity in forty minutes so that a positive shock was felt upon a hand being immersed in the pail. Electrical currents were felt in the hands and arms upon handling a pile of paper eight minutes after being printed. The bother to the printer is a considerable one. It entails inconvenience and a serious loss. Valuable work is frequently spoiled by the electricity packing the leaves so closely as to offset the fresh ink. Then the presses have to be slow-speeded, with frequent stoppages. Nothing so demoralizes the press-room as the mystery of frictional electricity when under full headway."

THE OPERATOR
AND
ELECTRICAL WORLD,
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W. J. JOHNSTON, Editor and Publisher.

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TELEGRAPHIC JOURNALISM.

While the changes recently instituted in this journal—in the enlargement of its pages and of its scope, and the increased frequency of issue—have brought to us a vast number of most gratifying expressions of approbation from old subscribers, and a substantial indorsement in the shape of a large increase in our subscription list and advertising patronage which fully justify the wisdom of our course, a few of our old-time and highly esteemed subscribers have been inclined to look upon the changes with disapproval; they have intimated that we were giving 'too much science," and have feared that THE OPERATOR, under its new name of THE OPERATOR AND ELECTRICAL WORLD, was drifting away from the honorable position it has held for years, of being the representative journal of the telegraphists of America.

These objections, although few in number, have the greater weight because they come from "old-timers" who were the mainstay of THE OPERATOR in the spring-time of its existence. With them we have battled side by side through many a hard-fought campaign, smothered many a wrinkle, righted many a wrong and groped through many a fog; and for their friendly interest we have much regard and consideration.

It requires no long argument, however, to show that the situation has changed, and that the tendency toward rapid improvement in every branch of electrical science has compelled us to choose between marching on with the sappers and miners in the van, or falling ingloriously by the wayside.

In widening the scope of our journal we have not been unmindful of the instructive examples afforded by the history of American telegraphy. That history is strewn with the wrecks of a dozen telegraphic journals, over each of which might be appropriately inscribed the pathetic epitaph:

"I wonder what I was begun for,
If I was so soon to be done for!"

If there is any lesson to be derived from this circumstance, it is that a telegraphic journal, to be successful, must furnish something more than the gossip and ephemeral chronicles of the profession, and this we believe to be now, more than ever, true. In the present electrical reawakening it is to the interest of every intelligent operator to keep his eyes and ears open to everything that is going on in the electrical world, even if it be only in the hope of reaping some material advantage from the rapid growth of the electrical industries.

As a simple matter of fact, however, we may point out that, while covering the whole field of applied electricity, the increased size of our journal and the frequency of its issue enable us to give *more* telegraphiana than have ever been given heretofore by any journal, even those devoted exclusively to telegraphy.

There is another aspect of this matter. THE OPERATOR AND ELECTRICAL WORLD is no mushroom growth. It has been built like the coral rocks—a solid aggregation of atoms—and can no longer be kept within certain prescribed and necessarily narrow limits.

When THE OPERATOR was founded there were few electricians who were not practical operators; the quadruplex and telephone were unknown, and the electric light, which now employs a multitude of workers, was scarcely dreamt of for general use. The operators who, as we have just said, were also the electricians, needed a mouth-piece, and THE OPERATOR spoke for them—how well is best known to our old friends. At that time it required a bold spirit and no inconsiderable amount of money to sustain a telegraphic—much less a purely electrical—journal, while the paper itself, containing a little crude science, a few personal notices and some local references which would now be considered hopelessly stale, was not required oftener than once in two weeks.

Since that period many of our original and most appreciative readers have transferred their abilities to other and higher, or at least more profitable, branches of the science, and we now find that we must cater to the demands of an increased and more critical and widely extended constituency. The telephone worker wants all the news about the 'phone and those connected with it; the electric light man wants to read of the latest dynamo and how his business is extending; the Pacific States want to know all about consolidations and mystifying movements in the East; another set of workers want a description of the latest patent, and possibly even Mr. Jay Gould himself looks to these columns occasionally for a "point" or two. At all events, THE OPERATOR AND ELECTRICAL WORLD finds a ready sale throughout the entire civilized world. We are compelled to have something to say weekly, and something worth reading, upon every subject relating to electricity, and the simple designation "telegraphic journal" does no more justice to our scope and aims than does the old but cherished title of THE OPERATOR.

We think that the members of the telegraphic fraternity believe with us that this accumulation of cosmopolitan character is highly beneficial to them. The varied information thus brought to their attention will tend to make them more valuable operators and better electricians. We believe that in the near future the fact that a telegraphist is a close reader of THE OPERATOR AND ELECTRICAL WORLD will benefit him wherever and whenever he may apply for a position; for, as its name indicates, its columns are the memorabilities of THE ELECTRICAL WORLD.

"AMATEUR ELECTRICIAN" writes us to inquire whether it is possible to intercept the magnetism of a magnet, and prevent its action from extending to a distance by the interposition of any substance. Briefly, it may be replied that the result desired is not possible. Such a substance does not exist, and magnets attract and repel without any perceptible loss through all bodies, only except those who can be made magnetic themselves, and on these their force appears to be spent to induce temporary magnetism in them, in fact make them them magnets also, when they will attract in their turn, namely, when near enough to the existing magnet. Those bodies are iron, nickel, cobalt and manganese, of which, however, the first is much more powerfully acted upon by magnetic influence than the others.

Is is a very old problem to find a substance which will intercept magnetic attraction, for the reason that if such substance existed, the great problem of perpetual motion would be solved, as then we had only to cause a machine to interpose the intercepting substance when magnetic attraction had moved a piece of iron toward a magnet, when it might be made to recede by proper attachments to the machine. This idea appears to occupy many minds, and inquiries about such a substance are repeatedly made, but one may as well ask for a substance to intercept gravitation. If this existed we would have perpetual motion by gravitation just as well.

Only some five or six years ago *Harper's Monthly Magazine* contained an illustrated description of a magnetic perpetual motion invented by one Geery, of Massachusetts. It was based on a similar mistaken notion that neutral lines would be found at the pole ends where there was no attraction, and by the aid of which he could produce a continued too-and-fro motion, but he soon found out his mistake, as the promise he made to exhibit his magnetic motor to the public was never fulfilled.

Now that the Western Union has practically for the time being a monopoly of the telegraph business, it would not be unnatural to look for a repetition of the same old game. The first act after such consolidations has been to "reduce expenses," which consists in discharging an operator and a line man here and there, and ordering the remaining ones to do extra work without extra compensation. This has always been supplemented, when it was safe to do so, by cutting off a dollar or two from an operator's salary. The second act occurs about the end of the first month, when one or two of the best operators, who are thoroughly acquainted with the business men, go over to some struggling rival line, taking nearly all their customers with them. Their places are filled by "cheaper" men, and the Executive Committee hears with much satisfaction that such and such an office has reduced its expenses about thirty dollars during the first month. The third act presents a scene of thousands of miles of fresh opposition lines, manned by willing and fairly paid operators, and cordially supported by the public. We cannot, of course, ignore the stern necessity for strict economy in its true sense in the management of a gigantic corporation like the Western Union, but we have much faith in the present management and believe that the officers will, even in their own interest, make the situation as easy as possible for all faithful employés.

THE so-called cipher dispatches, consisting in preconcerted words having another meaning than that which the words convey, are usually more or less nonsensical to the receiving operator, consequently an error in transmission of a single letter may not be so readily detected as is the case where a sentence is transmitted the meaning of which can be readily understood. The Western Union had recently an illustration of this to their cost, when at Stockton, Cal., a message reading, "Buy bail barley falun," was sent to San Francisco, where it was received, "Buy bain barley falun." Unfortunately in the cipher agreed upon "bail" meant "100 tons," and "bain" "225 tons." The consequence was that 200 tons were bought and $429 lost by the transaction. Suit was commenced and a judgment obtained against the Western Union for $429, the damage asked, and costs. No doubt cipher dispatches on the Stockton-San Francisco line will in future be transmitted with considerable care.

THIS journal has occasionally found reason to criticise the official conduct of the Chief Signal Officer, General Hazen, but we have no desire to be classed among those who willfully depart from legitimate criticism, and lug in a man's private affairs, as well as belittling a brave soldier. For that reason we regret to see that among the charges formulated by Congressman Beltzhoover, and read by him on the floor of the House of Representatives was one "that Hazen was found guilty of base and ignominious cowardice." We shall continue, when necessary, to criticise the official conduct of the head of the Signal Bureau, but we do not believe that any good can come out of cruel, and we believe unfounded, attacks upon the martial reputation of a soldier. If General Hazen has failed to administer the affairs of the Signal Service properly, the inquiry should be confined to that point.

SEVERAL of our readers having expressed regret that the articles on electric lighting did not mention the latest types and styles of dynamos, on account of the general interest which is felt in that subject, we desire to state that Mr. Mailloux has purposely deferred that part of the subject until he has made the general reader acquainted with the principles of electric lamps and other accessories that go to complete a system of electric lighting. To many of our readers these details will be as acceptable as and more opportune than any other, and, as it is precisely for this class of readers that the articles are intended, the specialist will forgive the digression; in due time Mr. Mailloux will again return to the dynamo, with all its recent modifications and improvements, and will take up in turn every system of any importance that is in use in this country or Europe, and discuss its distinctive merits.

IT ought by this time to strike the people of Pennsylvania that their constitutional prohibition of telegraph consolidation is already discouraging rivalry with, and even protecting, the Western Union. If a man with money enough, who is contemplating the building of a house, should be notified that he cannot sell it and that it would be escheated to the State should his honest venture no

prove a success, he would be very apt to make up his mind not to build, and to put his money into something over which he could have absolute control. Legislative interference with the business affairs of the people is a restriction of their liberties, and the mischief of such a course is soon shown in the withdrawal of capital from its baneful influence.

THE French Cable Company, which laid its cables on our shores under the distinct promise that it would not consolidate with any other cable company, and subsequently went into the Pender-Gould pool, refuses to give our Department of State any information on the subject. M. Pouyer-Quertier, the president of the company, may be a bigger man than most other Frenchmen, but he ought to be disciplined. We have an aversion to interference with private contracts, but since in this case there was, before the cable was laid, a specific agreement which has since been violated, it might not be amiss for Uncle Sam to pick up the American end of the French cable and buoy it on the high seas.

THE officials of Philadelphia are after the Mutual Union Company, or what remains of it, in approved style. On Wednesday last, the 28th ult., an ordinance was approved by the Committee on Law and ordered to be reported favorably to City Councils of that city directing the city solicitor to proceed against the bond of the Mutual Union, which was given for $20,000 as a guarantee that the company would not consolidate or merge with any other telegraph company. The ordinance also directs the superintendent of the police and fire alarm to confiscate the poles of the company in question.

As we frequently receive inquiries for information in regard to electrical science and its practical application, we have concluded to add to the departments of our paper one exclusively devoted to answering inquiries, even such as are only remotely connected with electricity. Such department will serve a double purpose; firstly, the answers will give the desired information to correspondent; secondly, the nature of the questions may frequently be an indication of the intellectual need of our readers, and show what special subjects would be most acceptable; consequently the department may be of mutual benefit.

IT has been said that Mr. Jay Gould, in order to enjoy his projected two years' trip, has been selling out his Western Union interests along with others. Without any special reference to this particular subject, Dr. Norvin Green, on being questioned recently as to Mr. Gould's holding of Western Union, said that a year ago it amounted to $21,000,000, but it had been increased to $30,000,000. Since Mr. Gould went into the company over two years ago not a share had been transferred from his name; on the contrary, the amount had been steadily increasing.

SURPLUS capital is always eagerly seeking investment, and as the Western Union can make good dividends on a hundred millions of watered stock, new rivals will soon be in the field. It is apparent that there is room enough for the legitimate and permanent investment of capital to compete against the Western Union, besides which there will be the usual stock-jobbing concern, chartered and nurtured only to sell out at a fabulous profit to its manipulators.

WE sincerely hope that the proposed visit of Dr. Norvin Green to Europe will result in a complete restoration of his health. His long career of hard and honorable labor entitles him to a season of rest, and we hope to see him return able to undertake many more years of his good work. It is understood that General Eckert will act as the executive officer of the Western Union during Dr. Green's absence.

THE adjournment of Congress to-day will lighten the duties of a good many telegraphists, and will enable the managers to dispense with much "extra." There will now be a period of comparative rest until the summer offices at the various watering places shall be opened.

The Electricity Generated in Walking on a Carpet.

T. E. P., Oswego, N. Y., asks: "How is it that in a few houses it is possible to generate enough electricity to light gas, while in others it is impossible to produce the same result?"

The essential condition is that the carpet is made of good non-conducting material, such as pure wool without admixture of cotton, and that it is separated from the floor by an intervening layer of felt, straw or the like. The only necessary condition, besides the condition of the atmosphere, is that every part of the carpet be *insulated* and *insulating*.

Every time we walk on a carpet of any kind the friction of our shoes or slippers always produces electricity. but this electricity is dissipated as quickly as it is evolved, because the carpet can conduct it away. But when the carpet is a comparatively good non-conductor and when the air is dry in the room and not moist, and there are no air currents that would dissipate the electricity, the amount of electricity which is evolved by sliding the feet over the floor remains on the body and soon accumulates in quantity sufficient to cause a spark.

If the carpet is not a good non-conductor, then all electricity evolved will be carried away through the floor as soon as excited. It is simply because the electricity cannot escape that it becomes perceptible in the person's body.

The flutter of a lady's silk dress as she walks over the floor in such a room gives rise to the phenomenon in a striking manner, because silk is one of the substances which can be most easily electrified by friction.

Thus, if a lady dressed in silk stands on an insulating stool (a stool having glass legs), the mere rubbing of her dress by another person will give rise to electricity. Friction of the dress with a whisk broom or brush will enhance the effects produced.

In the cases mentioned by our correspondent, the carpet acts not only as an element in the friction which generates the electricity, but it serves as an insulator that prevents its escapement.

If we rub a piece of metal with another, no electricity will be apparent; but if one piece of metal be provided with a glass handle to insulate it, that piece of metal will give evidence of electrical excitement, though, of course, not to the same extent as glass rubbed with wool, fur or silk would.

Vibrating Armature of Call Bells.

H. M. W., Coatesville, Pa., inquires what makes the electro-magnets of magneto call bells attract the armature alternately? Are they wound the same as in the ordinary electro-magnets of telegraph sounders and relays? Please reply through THE OPERATOR AND ELECTRICAL WORLD, and oblige.

The electro-magnets of call bells are wound the same way as those of sounders and relays. The peculiar behavior of the armature is due to the fact that the armature is "polarized" by one or more permanent magnets, so placed in connection with a bifurcation of one of its poles that both ends of the armature obtain the same polarity. As the electric current excited by the revolution of the crank causes the electro-magnet to obtain a north and a south pole, one of these will attract and the other will repell the end of the armature. But as this current is continually reversed at each half revolution of the bobbins, the poles of the electro-magnet will also reverse, and the end of the armature at first attracted will next be repelled, and vice versa.

Suppose, for instance, that both ends of the armature are of north polarity, the first impulse of the current will magnetize the electro-magnet and immediately its north pole will repel the end of the armature near it, while its south pole will attract it, thus causing it to tilt. But the current immediately changing in the other direction, the consequence is that what was a north pole in the electro-magnet is now a south pole, and attracts the north pole, while the south pole becomes a north pole and repels it, causing a tilt the other way. The advantages of this arrangement are twofold: firstly we have a vibrating armature, equally propelled in both directions, and thus able to strike two bells in place of only one; secondly, the arrangement works with a weaker current, as is the case with all polarized relays, which is important in this case, as the magneto currents generated by the revolution of bobbins before a magnet are much weaker than battery currents, and would not be reliable to operate electric bells moved by ordinary, not polarized electro-magnets.

That Animal Problem.

To the Editor of The Operator and Electrical World:

SIR: Having seen in THE OPERATOR AND ELECTRICAL WORLD the following problem, and not seeing the correct answer, I beg leave to give the same. "A man has $100 and he wishes to buy one hundred animals. He buys cows for $10 a piece, sheep for $1 a head, and geese six for $1. Required, the number of each." The following is the answer, which may be found (with the original example) in Tyro's Spyglass, Arithmetical Lexicon and School Teacher's Assistant, published in 1841:

5 cows @ $10	$50
41 sheep @ $1	41
54 geese 6 for $1	9
100 animals	$100

FISHERVILLE, N. H., Feb. 26, 1883. G. A. N.

Thanking our correspondent for the communication of the answer, we would remark that an answer is not the solution of a problem. Although this is not an electrical problem, its solution comprehends operations similar to those which, at the present day, are often necessary in the solutions of problems required for the determination of resistance in lines, cables, shunts, insulators and other electrical complications, so we think that the solution of this curious problem may be acceptable to many readers, even as an exercise in calculation.

Call the number of cows, sheep and geese, respectively x, y and z. We have, as their total must be 100 animals, and the total of their cost, the two equations:

$$x + y + z = 100 \text{ animals},$$

and

$$10x + y + \frac{1}{6}z = \$100,$$

The first equation gives

$$z = 100 - x - y,$$

and

$$\frac{1}{6}z = \frac{1}{6}(100 - x - y),$$

Substituting this for z in the second equation, we have

$$10x + y + \frac{1}{6}(100 - x - y) = 100,$$

multiplying with 6 to eliminate the fraction,

$$60x + 6y + 100 - x - y = 600,$$

or

$$59x + 5y = 500,$$

which gives

$$5y = 500 - 59x$$

and

$$y = 100 - \frac{59x}{5}$$

As x can only be a whole number it must be 5, and we have

$$y = 100 - 59 = 41$$

and

$$z = 100 - 41 - 5 = 54.$$

Canadian Notes.

The telephone people are stringing additional wires all through Montreal.

Mr. D. R. Ross has been appointed Secretary of the Montreal Telegraph Company.

The electric lighting of the city of Montreal has been what might be called a brilliant success.

The Canada Mutual Telegraph Company is in a very unsettled condition, pending the return of President Hosmer from Paris.

The Montreal Telegraph Company and the Grand Trunk Railway have been for some time in arbitration over a claim by the telegraph company for a large amount. The case was settled last week, the award being against the telegraph company, which gets less than one-third of the amount claimed.

The Mayor of Brockville has commenced proceedings against W. C. Anderson, late a telegraph operator of Lachute, who was recently mentioned in these columns as having fallen heir to $750,000, to recover $100 loaned him by His Honor. Anderson says he had been on a prolonged spree and had forgotten the transaction.

A suit was commenced some time ago by a shareholder of the Montreal Telegraph Company through the Attorney-General, to annul the charter of the company. The proceedings grew out of the opposition to the amalgamation of the company with the Great North-Western. The action of Parliament having rendered such a suit almost useless, it has been withdrawn.

A Dominion contemporary says that considerable expenditure has been made by the Canadian Government in improving the telegraph and signal service, especially in British Columbia, and the consequent dispatch of business on the line has commanded the confidence of the public, and the receipts have been proportionate. The heavy cable laid across the Saguenay River is operated under contract with the Montreal Telegraph Company at a cost of $1,200.

The French Cable Company Defiant.

In the national House of Representatives, on the 22d ult., the Speaker laid down additional papers (received since the report made to the House on the subject on the 12th ult.), in response to a resolution from the House of Representatives of July 15, 1882, calling for any information in possession of the Department of State in reference to any changes or modifications of the stipulations which the French Cable Company made with this government.

A letter from Pouyer-Quertier, the president of the company in Paris, is inclosed, in which he refuses to make known further provisions of the contract than have already been made known. He states that the company has complied with all the requirements of the contract, that it transmits messages for the United States Government free of charge, and has reduced materially the rates prevailing at the time the contract was signed.

District Messenger Competition in New York.

A well-informed correspondent writes to say that the present status of the district messenger business is not unlike a game of chess, with the evident advantage in the hands of the great monopolists; in any event, the outlook, he thinks, is anything but encouraging to the innocent shareholders.

To inefficient management and political ambition he attributes the misfortunes of the A. D. T., which at one time paid its stockholders a regular 7 per cent. dividend on $2,000,000 of stock. Internal dissentions and overconfidence, he says, have prevented the Mutual District becoming the success it at one time promised. The Manhattan Company, the latest candidate in this field, has already begun to cut rates.

In the heat of the battle, he goes on, is heard the bugle of the great monopolist, who announces the immediate introduction of pneumatic tubes into all the offices of the A. D. T. Co., from Twenty-third street south which, of course, means the transaction of letter delivery at the present expense for messengers car-fare. The purchased buildings corner of Twenty-third street and 5th avenue and at the Stock Exchange, are to be occupied jointly by the American District and Western Union Companies. This, with the organization of the Electric Protective Company, to monopolize and concentrate the burglar alarm business

and relieve the A. D. T. Co. of its expensive patrol and alarm system, would seem to indicate preparations for a vigorous campaign. With three Richmonds in the field—all pretty fairly provided with the sinews of war—it is hard to see what comfort there is for the shareholders.

It is still possible for an individual with a knowledge of the business to step in, provide his own capital and make rates that will defy either of these three messenger corporations, organized with a watered capital, a plant liable to Legislative action, and dependent upon the earnings of a lot of messenger boys, who at the best turn into the company but 50 per cent. of the profits of their service.

The Applegate Electric Alarm Co.

At a recent meeting of the Board of Directors of this company, W. F. Rose, manager of the Philadelphia branch of the National State Bank, was elected president; E. A. Armstrong, vice-president; John H. Applegate, treasurer, and Robert F. Stobo, late of the Pennsylvania Railroad Company, secretary. Among the new directors are W. W. Goodwin, president of the Goodwin Gas Stove and Meter Co.; E. A. Quintard, President Citizens' Savings Bank, of New York City; Colonel Rodney C. Ward, Collector of Internal Revenue, Brooklyn, and J. L. Harker, of Camden—all prominent men of well-known business capacity. The general manager, Mr. W. B. Murdock, has recently opened a store in Philadelphia, at 335 Chestnut street, in addition to those he already has in New York. He is very busy organizing sub-companies throughout the country, and expects a number of them to be in operation within a few weeks. The plan adopted is to put the alarms out on a reasonable rental and keep them in repair without extra charge. In a short time a company will be organized for Philadelphia and this section, and any who wish to avail themselves of the opportunity offered for purchasing an alarm to protect their houses against hungry tramps or enterprising burglars would do well to send in their orders to 335 Chestnut street.—*Camden, N. J., West Jersey Press, Feb. 28.*

Progress of the Fuller Electrical Company.

We are pleased to learn that the electric lighting system of the Fuller Electrical Company, of this city, is being successfully introduced in a large number of cities throughout the United States.

Mr. Albert B. Chandler, well known to most of the readers of THE OPERATOR AND ELECTRICAL WORLD, having formerly held the position of president in the A. & P. Telegraph Co., is president of the Fuller Company. The following information in reference to the progress of the Fuller Company will be of interest to electric light men:

The Springfield (Ill.) Electric Light Company has in operation 120 Fuller lights, which are reported as giving entire satisfaction.

The principal streets of Grand Rapids, Mich., and a large number of stores, hotels and business houses in that city, are beautifully illuminated by 170 of the standard lights of same company.

Mr. Geo. F. Milliken, for many years manager of the Western Union Telegraph Company, at Boston, Mass., has lately established an agency for the sale and installation of the apparatus of the Fuller Electrical Company, having his headquarters at 37 Pearl street, Boston.

The streets of the cities of Xenia and Dayton, Ohio, are now very brilliantly lighted by the Fuller system. The lights are reported as giving entire satisfaction to the local interests controlling them, and also to the community.

The Wheeling Electrical Company, organized some months ago, has recently placed itself in position for continuing the operation of the Fuller Company's system, which it has had in use for six or eight months past, and for materially extending the same in the city of Wheeling and its vicinity.

Sixty Fuller lights are now in satisfactory operation in the streets of Belleville, Ill., producing, as has been reported from that city, an effect all over the city equal to moonlight. The report further states that "this is the best lighted city in the United States."

The well known firm of I. R. Adams & Co., of 109 N. Third street, St. Louis, Mo., the Fuller Electrical Company's agents for that city, have already placed the company's lights in the establishments of the St. Louis Tunnel Co., the St. Louis Bolt & Iron Co., Dodd, Brown & Co., J. Stoutenberg, and August Gast & Co.

Mr. William Baxter, inventor of the celebrated Baxter engine, who has lately completed a contract for lighting certain streets in Jersey City, N. J., states: "We are running 56 lights (one 20 and two 18 light dynamos). These are driven by a Baxter automatic cut-off vertical engine, 12 × 12 cylinder, 240 revolutions per minute. 70 lbs. steam, cutting off at one-fourth stroke. The consumption of coal is less than two lbs. per hour per light, the latter being the Fuller Electrical Company's standard lights of 2,000 candle-power each. We are using ordinary anthracite coal, costing $4.60 per ton delivered in Jersey City. The above consumption of fuel includes also the heating by steam of the building (26 × 100 feet) in which the apparatus is placed. The building is constructed of wood."

The Edison Electric Light.

A reporter of the *Star*, of this city, has been inspecting the electric lighting of the house of Mr. J. Pierrepont Morgan, of the banking firm of Drexel, Morgan & Co., in this city. He finds that, weary of waiting for the uptown electric lighting district to be laid out and circled with wires to be connected with uptown residences, Mr. Morgan gave the first order for an Edison isolated plant among the mansions of the millionaires who inhabit Fifth, Madison and Lexington avenues. The plant is for 269 A and 116 B lamps, or a total number of 885 burners. "In a twinkling," he says, "as if by magic, from every window in the dwelling, on the evening in question, there broke forth a flood of mellow light that gave the appearance of a general illumination." After contrasting the Morgan mansion with its more dimly lighted surroundings, and admiring the simplicity of mechanism which controlled the electric force, the reporter called upon President Eaton, and asked him how many uptown palaces were prepared for the introduction of the electric lighting system.

"We are wiring the uptown mansions at a very rapid rate," was his response. "Among others, the homes of William H. Vanderbilt and his son, Cornelius Vanderbilt, are thoroughly wired, as are the residences of John Sloan, R. L. Stuart, W. I. Hutchinson, Ogden Goelet, R. L. Belknap, Robert Goelet, H. Lamb and the Hawthorne, one of the largest and most fashionable apartment houses in the city. The Dakota apartment house, at Seventy-second street and Eighth avenue, is being wired for 5,000 lamps, and orders for public and private houses are coming in daily."

Being asked if his company had done much work abroad, President Eaton replied:

"We have laid down a plant of forty lamps in a saw-mill at Yvaskyla, Russia, and it is the most northly Edison plant in the world, the town being situated between the 62d and 63d degrees of latitude. The Common Council of the Russian town propose to put up a central station of 500 lamps. We have six plants in Cuba; the Brunn Theatre in Austria is lighted by the Edison system, as are Rieck's paper factory at Helsingfors, Russia, the Academy of Fine Arts at Berlin, cotton mills at Tammerfors, Finland; one of the mills at Manchester, England; the street in Berlin known as Wilhelmstrasse; the *Morning Herald* at Sydney, New South Wales; nine plants in Paris, the Exposition at Bordeaux, making 32 plants in France; 11 plants in Italy, 28 plants in Germany, 4 plants in Holland, 7 plants in Austria, 14 plants in Russia and 12 plants in Belgium."

Being asked how many lamps his company now has in Europe, he said that there are 5,777 in Italy, 3,667 in Germany, 2,772 in Russia, 2,680 in France, 1,648 in Holland, 1,274 in Austria, and 1,268 in Belgium—a total of 19,536 lamps.

In answer to a question as to how many isolated plants they have now in this country, he replied:

"Our bulletin in December showed 153 plants, with 29,192 lamps. But since then we have received additional orders, so that we are running nearly 35,000."

A Decision in an Annunciator Case.

In May, 1881, the Western Electric Company brought suit against the Chicago Electric Company for infringement of the elevator annunciator patents of Augustus Hahl and Elisha Gray, both owned by the Western Electric Company. Several similar suits under the same patents had previously been brought against other manufacturers in St. Louis, Chicago and New York, but the cases had been settled before the final hearing. This suit, however, was contested vigorously, and was finally decided in favor of the Western Electric Company, by Judge Blodgett. The judge, among other things, says: "The defense of want of novelty rests mainly on the patents of Holmes and Corey for similar devices, and the analogous devices of Forster and the gas tube, by which gas is carried by means of a flexible tube to burners in an elevator car. The Holmes and Corey patents were put in interference with the Hahl patent before the Patent Office, and the commissioner on proof decided that the invention of Hahl was prior to that of either Holmes or Corey.

"I do not think a person could, without invention, from any hint or suggestion in the Foster device, by mere mechanical skill, adapt the system of electric calls used in Hahl's device to an elevator car. The same may be said of the flexible gas-pipe. The proof shows that since the Hahl and Gray patents, this device has been generally adopted for use in elevator cars, and its adoption, and the fact that almost simultaneously quite a number of inventors, two of them at least, Gray and Holmes, well known to the public for valuable inventions in the field of electrical science, had given their attention to the subject-matter covered by the devices now before us, is evidence that it required something more than mere mechanical skill to accomplish the result attained by this patent.

"As to the second point, that this device shows only a mere aggregation of parts and produces no new result, it is sufficient to say the result produced is the transmission of signals to a car, *when in motion*, which was new and had never been produced until this combination, and that some of the parts in this combination perform a new function and the whole combination produces a new result."

A Good Word for the Signal Service.

To the Editor of the Operator and Electrical World:

SIR: Noticing from time to time sketches in your paper from Signal Service men regarding that branch of the public service, I have thought that a few words from one who is still a member of the corps, and who has been for ten years, may be of interest to your readers.

I cannot see why there should be so much said against the service. I have found it much better than working for civilians. The pay is generally better and a man certainly commands more respect than he would were he simply a clerk in many other branches of business. The grumbling, I suspect, comes from the very class of men in the service who have least cause for it, that is, the men in the chief office (judging from the articles in your paper and from what I have heard from men who have been "banished" to the "horrid frontier"), who receive from $15 to $25 more per month than the men doing station duty. I fully believe that not two men out of twenty on stations ever complain about the hardships of the Signal Service, a great many of whom do station duty without assistance, where they put in from twelve to fourteen hours daily, while in the chief office at Washington eight hours out of the twenty-four is all that are put in by any one man. If the work has to be continued during the entire twenty-four hours, it is divided into three shifts of eight hours each, giving each man eight hours on duty and sixteen hours off duty out of the twenty-four.

The men in the service are treated as well, if not better, than the same grade of salaried men in civil life. Why there should be so much talk about detaching the weather branch of the Signal Corps from the army and transferring it to the Interior Department, is past my comprehension. It has been the same story ever since I have been a member of the corps, which has been since 1873. There would probably be as much, if not more, grumbling with this service in the Interior Department as there is now, for then a few men would seek the best stations and then try to get the salaries raised at large and influential stations, over others that are smaller, but of much more importance, in a meteorological sense. The duties are just the same on all stations, but there is more to perform on larger than on smaller stations, the latter having assistants, while the former are, in a great many instances, run by one man. I say, by all means retain the weather department of the Signal Service in the War Department, thereby keeping it entirely aloof from politics and political assessments from either party that may be in power. There is a great deal to say here lately regarding civil service reform. The Signal Service weather department is certainly run on that principle, for both a physical and mental examination must be passed by the applicant before he can become a member of the Signal Corps.

This talk of sending men to "the frontier" is all moonshine. It certainly ought not to be expected, when a person once gets to the chief office, that he should want to be screwed down to his chair and remain there as long as he is in the service, and if he should happen to be ordered away on station duty, then try to "kick" about it. I do not consider it "banishment" to be sent to Nebraska, Texas, Dakota, Colorado, California or Oregon. There are many members of the corps who would not be sorry to be "banished" to almost any station in the above-named frontier States.

I like the service so well that when my present term of service expires I shall re-enlist for five years more. The Signal Service pays its men promptly each month; when sick they are furnished with medical attendance, and if they die they are buried at government expense. During each month of service from four to five dollars is retained, which is not paid until the final discharge of the man from the service.

I do not see how it can cost any more to run the service by one department of the government than by another. In fact, if there be any difference, I am inclined to think it would be in favor of the War Department. I know that each station is run more cheaply than it would be in most cases by a private individual if he were conducting it on his own business.

I should think that the soreheads who have been in, and are now out of the service, would get tired of trying to make a sensation by talking against the Signal Service branch of the United States Army.

JAMES A. BARWICK, Sergeant Signal Corps, U. S. A.
SACRAMENTO, Cal., Feb, 15, 1883.

The Aurora Borealis.

To the Editor of The Operator and Electrical World:

SIR: I do not at this time take up the pen to refute the theories of would-be scientists; but to state facts. First, perhaps you will allow me to say that I am often disgusted at the theories put forth by them, based entirely on suppositions, or a part only of the facts necessary to enable them to arrive at right conclusions. Not many years since a certain professor delivered a lecture in Montreal on the age of the earth, nearly the whole of the lecture, as reported by the newspapers, being based on the supposition that if a certain sediment spoken of was deposited at the same rate annually since the creation as at present, then the earth was of such and such an age. But this little word *if* upset everything; so that he might better have remained at home, only for the dollars that he possibly put in his own pocket. I consider that a somewhat similar case is recorded in your issue of Jan. 13, second column, page 20, where you speak of Messrs. W. de la Rue and Hugo Müller investigating the height of the discharges of the aurora borealis; where rarefaction of the atmosphere is assumed to be (if I understand the article) the only thing necessary to be taken into consideration; but I am no scientist, and will turn to that which I saw and heard.

In the autumn of 1853, or the following winter, when crossing the foot-bridge at the locks, where the canal connects with tide-water in the town of Wisbeach, in Cambridgeshire, England, we observed a grand auroral display—that is, grand in appearance for that country—the peculiarities of which I have not seen equalled since or before. The streamers were directly over the canal; positively as low, or lower than the tops of adjacent houses; in fact, I could have shot an arrow from a bow directly through them, if such instruments had been at hand, or almost have thrown a stone through them; but their chief peculiarity was that they emitted a subdued, crackling, sighing sound, the crackling being exactly similar to that produced by one's hand on a cat's back after she has been lying close to a hot stove, only somewhat louder. The sighing sound was something

similar to that of a fire of shavings, or other light, blazing materials out of doors on a still night, but mild and subdued, not loud like the rushing blaze of a large fire. I believe it could not possibly have been heard at a distance of one hundred yards. I was in company with a Mr. Whitehead, with whom I then lived in New Walsoken, who was then an old man, and not likely to be alive now to corroborate this statement, though there may be others yet living in the vicinity who also observed the phenomenon. The time was not long after dark in the evening.*

I often thought of committing this to paper before, never having seen any one who had observed the like, but I never did so. I can at any time make affidavit to the truth of the foregoing, and I now leave it with you for the scientists to build their theories upon or to explain. What the pressure of the atmosphere was there at that particular time I know not, or how much humidity, or evaporation over the canal, or what the temperature, or whether the mingling of salt and fresh water had any influence. Neither do I know whether the tide was in or out; if out, there would have been bare mud directly under the streamers. T. W. RAMM.

PORT HOPE, Ontario.

The Denver & Rio Grande Railroad.

To the Editor of The Operator and Electrical World:

SIR: Having heard so much of Colorado's climate, etc., I determined on trying it for myself, and after an experience of a few months find it is a good State to come to for health. I had also heard what a grand affair the Denver & Rio Grande Railroad was, in the way of scenery, and am bound to confess it *is* grand. The line from Salida to Gunnison is a fine piece of engineering. I once thought the Horse-Shoe Bend, on the Pennsylvania Railroad, eclipsed all other feats of engineering, but the climbing over Marshall Pass—rising 217 feet to the mile, to an altitude of 11,000 feet—surpasses it.

Next comes the Black Cañon, west of Gunnison, whose rocky sides range from 15 to 1,500 feet high, the chief feature of which is the terrible danger incurred in moving trains through it. The rock is of a soft nature, and full of crevasses, hundreds—yes, thousands—of tons being liable to tumble at any time. The danger to life, limb and property is very great. The company appreciates this and moves its passenger trains over that part of the road at the rate of fourteen miles an hour. When the snow melts and the water comes tumbling down into the cañon, no doubt a long, serious blockade of the road will occur at that point.

In building this road—the Utah extension—the "construction company" has secured a large number of unnecessary miles. At one point, to save boring a tunnel through soft rock 490 yards in length, they have built 1¾ miles around, one mile of which is as dangerous as the Black Cañon. So it goes all the way. The best feature I notice is the telegraph, which is superintended by Mr. B. F. Woodward, an old-timer and member of the U. S. Military Telegraph Corps. The line is well built and works well. Only one wire is in use west of Montrose, but a four-pin arm on which that wire hangs looks as if a heavy business were expected when the road is completed to Salt Lake and Ogden, which will probably be about May 1, 1883. OLD BALDY.

B. & R. G. R. R., Feb. 12, 1883.

Frank L. Pope Says He Is Not "Prof." Pope.

To the Editor of The Operator and Electrical World:

SIR: I am not "Prof. Pope." I do not know who "Prof. Pope" is; nor what he is professor of, but there is reason to believe that a knowledge of English grammar is not included among his professional accomplishments, if his alleged indorsements of a so-called "work of reference" for electricians, now being extensively advertised, may be regarded as a specimen of his abilities in that direction.

This explanation is perhaps necessary in behalf of persons who may not otherwise be able to distinguish between "Prof. Pope" and myself, inasmuch as, for my own part, I feel constrained to disagree materially with the professor in his estimate of the work in question. If my opinion of the performance were asked (which it has not been), a proper regard for truth would compel me to say that it is a compilation of miscellaneous second-hand material, in great part utterly valueless, and, moreover, badly printed on cheap paper. It may possibly be worth the price asked for it as a literary curiosity (if the word literary may be applied to so illiterate a performance), but certainly not for any other imaginable reason.

May I be permitted to suggest that the "author" of this valuable compendium, who I understand was formerly a "Publishing Company" and is now a "College of Electrical Engineering," might improve this opportunity to add to his well-deserved reputation by incorporating himself as a Society for the Dissemination of Useless Misinformation. FRANK L. POPE.

ELIZABETH, N. J., Feb. 26, 1883.

THE ELECTRIC LIGHT.

The experiment of lighting Dayton, O., by electricity recently well nigh proved a failure, because the machinery was all new and did not work well.

It is said that Cleveland, O., people are thinking of discontinuing the electric light on account of its high price. They have better light than before, but it is stated that it costs them four times the price of gas formerly employed.

Tests for electric lights in fogs in New York and London harbors show they cannot be seen as far as gas lights of equal candle-power. The advantage of the electric light in navigation is that it is portable and can be used on all steam vessels at comparatively little cost, which, together with the steam telegraph, ought to make ocean travel safe.

The residents of Seabright, N. J., are building a powerful electric apparatus, and hereafter all the streets of Seabright and the Ocean Boulevard at Monmouth Beach and Bellevue will be lighted by electricity. For some time the section has been overrun by midnight raiders. The residents are adopting the above sensible plan of putting an end to the burglaries.

ELECTRIC ILLUMINATION OF THEATRES.—Reports from Brooklyn state that at the end of February the electric illumination of the Park Theatre is to be introduced. The system adopted is that of incandescent lamps. Unlike other electric illuminations of large public buildings, it will be exclusively electric, the use of gas being entirely set aside, incandescent lamps being used as well for illuminating the scenery, foot-lights, entrances, stairs and hallways as for the auditorium. Details of this interesting experiment have been procured for one of our future numbers.

We noticed last issue that the lighting of the Brooklyn bridge by electricity had been awarded to the United States Company. From the report of Engineer Martin we learn that the bids were as follows: Arnoux-Hochausen Electric Company, $15,750; United States Illuminating Company, $18,150; Schuyler Electric Light Company, $20,000; Edison Electric Light Company, $21,500; Brush-Swan Electric Light Company, $23,278, and the Fuller Electric Company, $25,455. The bids were for supplying seventy lights, the proposal to include engines, dynamos, conductors, lamps, lamp posts and everything, except the steam, necessary to make a complete plant. Preference was expressed for the acceptance of the second bid, owing to the circumstance that the lowest bidder had had less experience in circuit lighting. The question was referred to a committee, who so decided.

ELECTRIC LIGHT ON STEAMERS.—The introduction of electric illumination on board of ocean steamers is progressing slower than should be the case, considering the many accidents, which might have been prevented by the use of powerful electric signal lights. But after all it can not be said that the maritime interest is more backward than others in recognizing the importance of the important improvement in illumination. For instance, in the city of Manchester alone the agents of Mr. Siemens have, during the year 1882, provided five steamers with electric light. The Normandy, 400 incandescent and 16 arc lights; the Arizona, 300 incandescent lamps; the Antonio Lopez, 90 incandescent lamps; the Austral, 170 incandescent lamps and 4 arc lights; the Orient, 160 incandescent lamps and 4 arc lights; in all 1,100 incandescent lamps and 24 arc lights. This is pretty good for a beginning in one single seaport.

TELEPHONE DEPARTMENT.

Under the able and energetic management of its enterprising president, Mr. E. T. Gilliland, the Missouri and Kansas Telephone Co. is rapidly opening new exchanges and developing its territory and business to wonderful proportions.

THE SPLIT DIAPHRAGM TELEPHONE.—Mr. José D. Husbands has sent us a copy of his English patent (No. 3,008, of 1882), showing him to be the inventor of the "split diaphragm" telephone, which was attributed by a correspondent of this journal some time ago to another inventor.

The papers are telling about a Twenty-second Ward young man, Philadelphia, whose principal duty in an uptown bank was to answer the telephone, who went to the hospital the other day with his left ear developed to three times its natural size. Similar cases, but not so striking, have, they aver, been noted. The explanation given is that the electricity passing from the receiver to the body through the ear is supposed to stimulate the growth of the parts.

An exchange tells this exceedingly probable story: "Daisy Bush was the 'hello' girl in a telephone exchange in one of the oil country towns. Not long since she got tired answering calls and sat down to rest. The president of the company rang furiously two or three times and finally she answered him gruffly. He said he wanted the secretary quick, as it was a matter of the greatest importance. She told him she wouldn't do it. After swearing a while, contrary to rule, he told her he would marry her if she would give him the secretary. He had him in 20 seconds and now he has Miss Bush, and she is superintendent of operators."

The announcement is made that a Lowell syndicate has bought out the Northwestern Telephone Company, with the right to the entire telephone business in Minnesota, in Burnett, Douglas, Paine, Polk and St. Croix counties, Wisconsin, and in the Territory of Dakota north of parallel 45 degrees. The lease from the American Bell Telephone Company is understood to be perpetual. Some Lowell men, with several of the present Western board, will constitute a Board of Directors. It is understood the capital will be $1,000,000. The territory bought has 1,500 subscribers. The Lowell syndicate seems determined to buy up all the telephone territory it can get its hands on.

ANOTHER NEW COMPANY.—A certificate incorporating the Overland Telephone Company was filed with the Secretary of State at Albany on the 24th ult. The company has a capital stock of $1,000,000, with power to increase the same to $10,000,000, and is formed to construct and operate telephone lines "from New York City to Albany, thence to Buffalo, touching and extending to all points in the State into and across other States and Territories of the United States, and into and through the other countries composing the Western Hemisphere." The incorporators are Washington, New York and Brooklyn capitalists.

EXTENSIONS IN NEW JERSEY.—The managers of the Delaware & Atlantic Telegraph and Telephone Company are contemplating extensions of their service which will put their Philadelphia subscribers in communication with the residents of the principal towns in Southern New Jersey and the neighboring cities in Pennsylvania. They expect to spend $25,000 in these extensions. Connections will be made with Atlantic City, Cape May, Woodbury, Swedesboro, Woodstown, Salem, Bridgeton, Millville, Mount Holly, Trenton and Burlington, New Jersey. Besides having charge of the territory included in the southern counties of New Jersey, the company has also the State of Delaware. It is also proposed to join with the Philadelphia exchange the branch offices at Wilmington, Chester, Darby, Germantown and Frankford.

GOVERNMENT BY TELEPHONE.—The *Morning Journal* of this city, referring to the fact that another of the imprisoned Irish agitators has been elected to the British House of Commons, and that several others of the honorable M. P.'s, are now enjoying the retirement of a British jail, suggests that telephones have done away with the necessity of the presence of a debater in an assemblage in which he makes a speech. If the government provides telephone line between the jails and the Parliament, it adds, the imprisoned members can listen to and take part in the debates, and record their votes just as well as if they sat in the seats to which they have been elected in the House. Under such an arrangement it remarks, in conclusion, their violent interruptions will not be so frequent, the law will be vindicated, and the guarantees of the ga-lorious British Constitution will be preserved!

DASHES HERE AND THERE.

BALL OF COLUMBUS TELEGRAPHISTS.—The telegraphists of Columbus, Ohio, will give their first annual reception and ball, on Monday evening, March 26.

MR. GOULD'S LAST RESTING-PLACE.—Mr. Jay Gould has contracted for the erection of a handsome vault for his plot in Woodlawn Cemetery. The structure is to be of Quincy granite and is to cost $75,000.

Herr Fahdt, of Dresden, has perfected an arrangement for cutting glass by electricity. The wires are so arranged that when the current is turned on the cutting points become red hot, and as the glass is passed between them a clean crack follows:

THE WESTERN UNION TRANSFER BOOKS.—At a meeting of the executive committee of the Western Union Telegraph Company, held on the 21st ult., it was resolved that the books for the transfer of the capital stock of the company be and remain closed until March 1, and be re-opened on the morning of that day.

THE EFFECT OF LIGHTNING.—The carcasses of animals killed by electricity cannot, it seems, be used as food. The blood, it is found, cannot be extracted; and for the same reason animals killed by a lightning flash, even though not charred or otherwise structurally injured, cannot be used for food, but ordinarily have to be buried.

THE MORSE MEMORIAL TABLET.—A cablegram dated Rome, Italy, Feb. 27, says that the unveiling of a memorial tablet in honor of the late Prof. Samuel F. B. Morse, in the house in which he resided when in Rome, will take place on March 5. Mr. Astor, the American Minister, and a deputation from the municipalities will be present during the ceremony.

AN UNUSUAL ROUTE.—Saturday, Feb. 3, is said to have been the busiest day ever known in the Western Union office at Galveston, Texas. Business for New York was received in that office direct from St. Louis and Chicago, and was sent direct to New York from Galveston. The prostration of the direct lines between the East and the West by storms was the cause of this unusual procedure.

THE PITTSBURGH MUTUAL UNION OFFICE.—We learn from the Pittsburgh papers that there is no intention at present of closing the Mutual Union Telegraph office in that city. Manager Adams said last week: "My last instructions were to keep the office open and to maintain the same service as heretofore. There will be no change in the rates or the number of employés, and the office will be conducted on the Mutual Union principles, just as it was before the consolidation."

AN OPERATOR AS A CONSUMER OF RED HERRINGS.—E. F. Cheshire, a telegraph operator in the employ of the Long Island Railroad Company, at Long Island City, is eating, on a wager of $100, two red herring a day for thirty days. He has been at his task for the past twenty days. As soon as the boys along the line heard of it, they began sending him red herrings by express. He now has over twenty boxes of herrings. If he doesn't win it will not be for lack of material.

A FEMININE OBJECTION TO CHEAP TELEGRAMS.—An astute correspondent tells me, says the London *Truth*, that he (the writing is very like that of a lady) has just discovered the true reason why ladies object to the idea of cheap telegrams. They say that men will always use them in preference to writing, and that documentary evidence in breach of promise cases will thus become very scarce. A man who thinks so much about his sixpences ought, if caught, to at least make an economical husband.

At Albany, Feb. 26, Mr. Daly's bill requiring telegraph and telephone companies to place their wires under ground prior to March 1, 1885, came up in committee and was passed unanimously and without opposition, thus cutting off an eloquent and convincing argument which Mr. Daly had prepared in support of his measure. The same bill passed the Senate last year, but was killed by procrastination in the Assembly, aided, some say, by the "solid" arguments of the corporations opposed to it. It is before the Assembly Committee on Cities this year, where a similar fate for the measure is apprehended.

T. M. B. A. ASSESSMENT.—Assessment No. 162, dated March 1, 1883, has been issued by the Telegraphers' Mutual Benefit Association. It announces the death of Mr. Henry F. Makepeace, at Jersey City, N. J., on Jan. 10, of acute pneumonia. One dollar is due to meet this assessment, from members holding certificates up to and including No. 4,359. The number of members of the association in good standing is 2,400 in the first division and 152 in the second division; net increase in membership since last assessment, first division, 25; second division, 5, which shows that the association is making good progress.

UNDERGROUND WIRES FOR BROOKLYN.—The Brooklyn Fire Department propose to put their telegraphic wires underground and are now taking the estimated cost of this much desired reform. The system they propose to adopt is the same as has been in successful operation for over a year between Fire Headquarters and the Police Headquarters of this city. The system is known as the "Woodward," having been invented by Mr. A. T. Woodward, a practical electrician of this city. The test cable of this system has been operating for two years at Prospect Park, Brooklyn.

ELECTRICITY FOR LOCOMOTION.—Two English electricians claim to be able to bottle up 12 horse-power in a storage battery weighing three hundred-weight, and they promise to produce in a few months a perfectly practical electric tricycle capable of running 15 or 20 miles without recharging the accumulators, and able to ascend all such hills as are now possible for the foot tricycle, and even steeper gradients if auxiliary foot gearing be used to help the

*See "Aurora Borealis," in Chambers' "Library of Universal Knowledge," New York reprint of the Edinburgh (1880) edition, Vol. 2, page 24.

electromotor when the incline is great. The weight of the batteries will not exceed the weight of a second rider, and it will run at the rate of seven miles an hour.

AN ELECTRIC PUMP.—A novel application of the electrical transmission of power has been made at the Trafalgar Collieries, Forest of Dean, England. A pump in the underground workings is driven by an electric motor, the current, generated by a dynamo machine at the surface, being led down the shaft and along the workings a distance of 500 yards. The drainage water of the deep workings is raised by the electric pump 115 feet vertically and forced through 500 yards of piping to the bottom of the shaft, whence it is raised by steam pumps to the surface of the ground. The working of the electric pumps is said to be very satisfactory.

RUNNING WIRES THROUGH NINE MILES OF HOLES.—The Buffalo (N. Y,) *Express* says: "Work on the Brown block, which is being remodeled to suit the wants of the Western Union Telegraph Company, goes on rapidly. Supports for 1,100 wires have been placed on the roof. To admit all the wires contemplated and to carry them through the building in the several stories it is stated that 150,000 holes will have to be bored, three-eighths of an inch in diameter, and most of them through cleats or joists four inches thick. This is equal to one continuous hole 600,000 inches long, 56,000 feet, or over nine miles. A separate contract for the boring of this nine-mile hole has been let."

STOCK QUOTATIONS.—Telegraph, telephone and electric light stocks were quoted as follows on Wednesday:

	Bid.
Western Union Telegraph	82⅝
Mutual Union Telegraph	19
American Cable	65½
American District Telegraph	33
Bankers and Merchants' Telegraph	120
Edison Electric Illuminating	75
Edison Electric Light	475
U. S. Electrical Light	131½
Fuller Electrical	33
Mexican Telephone	4⅛
Bay State Telephone	128
American Bell Telephone	277
Tropical Telephone	2¾

FIGHTING THE LEASE OF THE MUTUAL UNION.—On last Saturday, the 24th ult., an argument of almost interminable length took place before Judge Freedman, in Special Term of Superior Court, on a motion to continue the temporary injunction now existing, to prevent the completion of the proposed lease of the Mutual Union Telegraph lines to the Western Union Telegraph Company. The suit was brought by Josiah C. Reiff in behalf of himself and other stockholders of the Western Union Company. He claims that the proposed lease would impose additional burden upon the stockholders of his company because it had assured to pay dividends and interest on illegal stocks and bonds of the Mutual Union Company. Affidavits were submitted from the presidents of both companies and from the secretary of the Western Union, after which the judge took the papers and reserved his decision.

A NOVEL ADVERTISEMENT.—A Chicago firm, dealing in furniture for railroad stations, recently removed to a different address, and seized the occasion to advertise its business in an ingenious manner, by sending to the various railroad purchasing agents what appears, at first glance, to be a telegram on a Western Union blank. A closer inspection shows the heading of the blank to be "The Union Telegraph Company (?)" and the body of the message to be a lithographed imitation—and a very good one—of the characteristic handwriting of a telegraph operator. The "contract" at the head of the blank reads: "We manufacture and deliver settees upon conditions as stated in our catalogues, satisfaction guaranteed. Errors in orders can be guarded against by repeating messages by mail. This company stands ready to oblige in the transmission or delivery of Victor station settees (on cars at factory) promptly, and make good any breakage of castings or shortage if presented within five years after sending message. This is an unrepeated message, and is delivered by request of sender, under the conditions named above."

NEW YORK CITY ITEMS.

Echoes from 195.

Mr. E. M. Boynton, manager of the W. U. office, Meadville, Pa., gave us a call last Monday.

Mr. Frank Halstead and Mr. Owen S. Kennedy, of Kingston, Ont,, now work the Providence quad.

Mr. W. E. Pierce, who has been receiving night press in Norwich, Conn., for a year past, has resumed work in 195.

To "Inquirer."—You were misinformed. It is only six months since the scaffolding was erected in the operating room.

Mr. John Morris, of the Newport, R. I., wire, was married to Miss Annie Locks, of New York City, in Apollo Hall on the 25th ult.

Mr. Charles Rust, of the L. I. R. R. office, Hunter's Point, N. Y., was married to Miss Hattie Abrams, of this office, on the 13th ult.

Mr. A. M. Pennock, of the Chattanooga, Tenn. office, was in New York last Friday, having come north in charge of the remains of the late Mr. Samuel Swartz.

Mr. Charles L. Hilliard, formerly of Oakville, Ont., has resigned and gone to Chicago. His ultimate destination is about 200 miles west of Winnipeg, Manitoba, in which locality he intends to preempt farming lands.

"S. P. Ortingtigs, Chicago," for *Sporting Times*, Chicago; "Time officials hanged to three o'clock" for "Time of funeral changed to three o'clock," and "comb and brushes" for "combinations," are of recent occurrence.

Mr. Charles Reynolds, an operator, and brother of Frank and Harry Reynolds, of 195, and George Reynolds of 135 Broadway, died of consumption on the 13th ult., in Gainesville, Fla., and was buried in Cobourg, Ont., on the 19th ult.

The third annual meeting of the Telegraphers' Aid Society will be held in the rooms of the New York Electrical Society, 144 Greenwich street, corner of Liberty street, on March 11, 1883, at 2.30 P.M. The election of officers and standing committees for the ensuing year will take place, and other business of importance will be transacted.

There was a number of telegraphists at the annual reception of the Thirteenth Regiment of Brooklyn, N. Y., on the 21st ult. 195 was represented by Mr. R. C. McDonald, Mr. Frank Halstead and Miss Helen C. Calahan, Mr. Frank Jessen, Miss F. L. Dailey, Mr. and Mrs. J. J. Calahan, Mr. Lewis Horton and Miss Geraldine Meehan, and Mr. Albert Watson. Mr. Walter V. Morgan, of the American Rapid, and wife were also present.

At the main assorting-table in the operating room there are probably on an average some 40,000 messages handled daily. The assorting and distributing of this large business requires experience, deftness and a thorough knowledge of the various wire routes throughout the country; but familiarity with the work soon renders the clerks so expert, that a glance at an address suffices to show the destination of a message, and the hand almost mechanically places it in the proper receptacle. The assorting clerks at present at this table are Misses Minnie Cook and Mamie Crough, assisted by Misses Annie Halloran, Ida Thiell, Lottie Wiggins, Nellie Carroll and others.

The New York correspondent of the Philadelphia *Evening Telegraph*, writing to his journal about the Western Union lunch-room at 195, which is for the employés of the company only, says: "As the service in the building is constant, four meals a day are served, one of which (as the Irish operator remarked) is served at night. Aside from the economy and convenience of such an arrangement, it is a real kindness to many of the employés in insuring them a wholesome meal instead of the pastry and pies which constitute the mid-day lunch of so large a part of our working classes. My attention was forcibly called to this disregard of all rules of diet recently while standing for a few moments at the counter of a popular bakery in Fulton street at noon. The young boys and girls crowded in faster than they could be served, many with half a dozen commissions to fill, and the orders were all for pies or cakes. Ten hours labor with such sustenance is enough to break down a very strong constitution. The Western Union lunch-room supplies meals to 1,000 persons daily."

Other City Items.

The employés of the American Rapid Company will give a grand masquerade ball on Tuesday evening, April 3, at Lyric Hall.

Mr. C. Donnelly, late cashier of the American District Company, has returned to New York after several months' absence in Mexico.

The grand annual ball of the employés of the American District Company will take place at Lyric Hall on the evening of Wednesday, March 7.

We hope to be able to publish in our next issue a report of the lecture of Mr. Mailloux before the New York Electrical Society last Friday evening. The cuts to illustra te it could not be got ready in time for the present number.

When the Metropolitan T. & T. Co., of this city, changed one of its offices from New street to 198 Broadway recently, one mile of cable was needed without delay. This mile of cable was forwarded by the Western Electric Co., Chicago, by express, the same day on which the order was received. The weight of the cable was about four tons.

135 BROADWAY.—Mr. Todd has gone to Pittsburgh for the Rapid. The ventilating properties of the operating room at 135 are excellent. Mr. F. A. Cloudman, who some months since left for Mexico, has returned to this city, looking exceedingly well. The consolidation has, as yet, wrought no marked changes at 135. Business is being transacted as heretofore.

A few months ago the hardware store of William N. Beers, on Third avenue, was entered by burglars, who carried off about $400 worth of goods. Mr. Beers then had a burglar alarm placed in his store, connecting with his residence. The other morning he was awakened by the ringing of the alarm, and, accompanied by his clerk, he hastened to the store and found a man crouching behind the counter. The burglar pleaded guilty and was committed for trial.

Mr. Solomon A. Blumenthal, stenographic clerk for Vice-President May, of the American Rapid Telegraph Company, 187 Broadway, was last seen on lower Broadway, Friday, Sept. 23. Although Detective Sergeants Adams and Gautier, assisted by Messrs. E. B. Powers and Charles Hoff, of the Mutual Company's office, have scoured the city thoroughly, no clue whatever can be obtained of his whereabouts, and suspicion of foul play is entertained. Mr. Powers has started for Lone Tree, Neb., to institute a search along the Platte River, where it is said Mr. Blumenthal has some relatives residing.

PERSONAL.

BOSTON.—The Mutual District Telegraph Company and the District Telegraph Company are to be consolidated at an early day. Mr. D. J. Hearn of the former company has been offered the position of superintendent for New England of the new concern.—*Boston Globe.*

ELGIN, ILL.—We regret to learn that death has visited the family of Mr. Wm. Hubbard, manager of the Elgin, Ill., Telephone Exchange, and also manager of the Elgin (acoustic) Telephone Co., and taken away his little three-year-old daughter, Lottie E. She died February 14, of scarlet fever, after an illness of only four days. Mr. Hubbard is an ex-telegraphist, and his old associates in the business will, we are sure, sympathize with him in his bereavement.

THE WESTERN UNION'S PRESIDENT.—When Dr. Norvin Green consented to continue as the head of the Western Union Telegraph Company, it was with the understanding that he was to take a long rest. He is now preparing to go to Europe, to remain two months and probably longer. He said recently that he would take steps to secure the listing of the Western Union on the London Stock Exchange. He would arrange with a responsible house to make transfers of the stock and pay dividends on it. The stock could be listed easily enough, Dr. Green declared, but the point was to put it on a footing whereby dealing in it would be encouraged. It is said that Mr. Green has long been suffering from catarrh, and he hopes that the trip will benefit his health.

CHATTANOOGA.—Mr. Samuel G. Swartz, aged 33, a native of Easton, Pa., died here on Sunday night, Feb. 18, of typhoid pneumonia, after an illness of about three weeks. The funeral services were held in the parlor of the Hamilton House, the pall-bearers being Thomas H. G. Comstock, C. T. Raymond, W. T. Stone, J. F. Riley, C. H. Skelton, F. W. Gerstine, J. E. Rolston and A. M. Pennock. The floral tribute, from his friends in this office, was a large wreath composed of azalias, smilax, camelias and ivy, in the center of which was "30" composed of bouvardias. The remains were taken to Easton, Pa., in charge of Mr. A. M. Pennock, and were buried with masonic honors in that city. Mr. Swartz was one of the men who came to our aid during the yellow fever scourge of 1878, and during his residence here he had made many warm friends. Mr. W. H. Glover, from California, is now working here. Bogardus was with us recently, and remained a week with his old friend, Manager Norris.

PROVIDENCE, R. I.—Until a year ago the Providence Western Union operators were among the best paid in the country. Since that time an era of "economy" has prevailed, which has resulted in many changes. It may be interesting to many to know what has become of the old-timers. Mr. A. C. White, for many years chief operator here, is now assistant superintendent of the Providence Telephone Company; Mr. A. L. Suesman is manager of the American Rapid office; Mr. J. H. Ingraham is with the Associated Press, days, and Mr. C. H. Bogle, nights; Mr. M. H. Crane is with the United Press Association in Washington; Mr. W. B. Ingraham is keeping books for Messrs. Chace & Butts, brokers, of Providence; Mr. G. W. S. Burroughs is operator for the same firm, and Mr. James S. Hall is also operator in a broker's office. All these gentlemen worked together for many years in the Western Union office, and all left near about the same time, on account of the institution of the policy referred to.

TON NOK.

PENNSYLVANIA RAILROAD, S. & L. WIRE.—At Xa is the good "Co," our kind division boss, who very seldom answers "No," and hardly e'er gets cross; and then there's "R.," a splendid man, who rushes trains by day; he does a favor when he can, and reckons up our pay; there's "Os" (Plugs, be quiet—hush!) a very man of might, who's worked all day in many a "rush," and stayed awake all night; and also "H," a rising boy, who round the office whirls, and thinks it is the greatest joy to be out with the girls. At Sj Mr. "J." holds forth with a distinguished air; you'd judge he was a million worth, to see his golden hair; and then at Pb there is "A," who hasn't much to do, and tries to while the hours away in pastime—wouldn't you? And there's our "extra" man, "Qo," who, although young, is prudent, and probably will no further go than to smile on the lady student. At Mx may be found "Jd;" of late he's full of joy; he surely has a right to be, because it is a boy! At Bx is our friend "Fo," who runs the rubber works (right here I want to let you know he's one who never shirks); and at Bv is Mr. "S.," an operator fair, who's taken himself a wife, to bless his home and smooth his hair. Now on to Fi; there is "G," a very handy man; if you want something mended free he'll do it, if he can. At Kf there is "W," who is head of all his class; a man who'll never trouble you with any kind of "sass;" and also F, quite six feet high, who puts on lots of style; he'll take car numbers "on the fly," and talk to you the while; and here we meet our friend "Rd;" you ask does he sleep all night? Not much, my friend! Oh, no! not he; for that would not be right. At the last office you will see a man who looks well fed, and if you're ever at Gd you'll hear him signing "Ed."

MUM.

ELECTRICAL PATENTS ISSUED.

Week ending Feb. 20, 1883.

Alarm signal apparatus for telephone exchanges; Edward A. Woelk, Springfield, Mo.	272,505
Electric underground conductor; Rudolph M. Hunter, Philadelphia, Pa.	272,441
Electric railway signal; Edward L. Orcutt, Somerville, Mass.	272,464
Electric log or apparatus for ascertaining the speed of ships and the rate of currents; Robert M. Lowne, East End Finchley, County of Middlesex, England	272,724
Electro-magnetic regulator; Richard H. Tucker, East Orange, N. J.	272,799
Electric arc light; Jean A. Wetmore, Concord, Mich.	272,811
Electric interlocking railway signal and switch system; John K. Knight, New York, and Wm. H. Baker, Brooklyn, N. Y.	272,839
Insulated electric conductor; Alfred A. Cowles, New York	272,659-0
Metallic circuit for electrical currents; Samuel D. Strohm, Philadelphia, Pa.	272,792
Signaling apparatus for district and fire alarm telegraphs; Thomas A. Casey, New York, N. Y.	272,645
Telegraph wire coupling; Graham Brott, Waterford, N. Y.	272,524
Telegraph cable; Nicholas M. Rittenhouse, Baltimore, Md.	272,774
Voltaic battery; Julius M. Stebbins, New York, N. Y.	272,493

BUSINESS NOTICES.

If you want to become a telegraph operator send 25 cents to C. E. Jones & Bro., Cincinnati, for best illustrated instruction book.

Copies of BERLY'S ELECTRICAL DIRECTORY have arrived and orders can now be filled. Price, prepaid, $2.50. Address Cumming & Brinkerhoff, 219 East Eighteenth street, New York.

A BIG TELEPHONE PURCHASE.—MESSRS. HAINES BROS., of 55 Broadway, New York, have just received a large and valuable telephone property. A limited amount of stock will be sold at a low figure, and the investment will pay a large per cent. within six months. Correspondence solicited.

The Boston and Sandwich Glass Company furnishes the globes used by nearly all the various electric light companies in the country. The quality of these globes is of the very best. The salesrooms are at No. 17 MURRAY STREET, NEW YORK, the company being represented by MR. C. E. L. BRINKERHOFF.

The attention of persons interested in local telegraph and telephone organizations is respectfully called to the electric lighting system of THE FULLER ELECTRICAL COMPANY, and the practicability of making arrangements with that company for the introduction of its apparatus, either in isolated plants or through the formation of local companies desiring to engage in the business of electric lighting. The specially valuable features of this company's system may be seen by examination of its apparatus in Boston, Worcester, Providence, New York City, Brooklyn, Jersey City, Paterson, Philadelphia, Hartford, Lancaster, Scranton, Syracuse, Rochester, Buffalo, Pittsburgh, Wheeling, Steubenville, Xenia, Dayton, Grand Rapids, Chicago, Springfield, Belleville, St. Louis, St. Paul, and many other smaller places throughout the country. Correspondence is invited. THE FULLER ELECTRICAL COMPANY,
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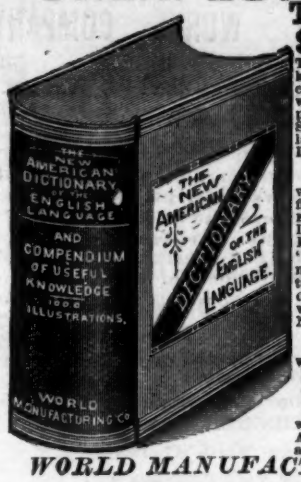
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"We have examined the New American Dictionary and find it is a very valuable book.—HOUSE & HOME. "We have never seen its equal, either in price, finish, or contents."—THE ADVOCATE. "Worth ten times the money."—TRIBUNE AND FARMER. "A perfect Dictionary and library of reference."—LESLIE ILLUSTRATED NEWS. "We have frequent occasion to use the New American Dictionary in our office and regard it well worth the price."—CHRISTIAN UNION. "With the New American Dictionary in the library for reference, many other much more expensive works can be dispensed with, and ignorance of his country, history, business, law, etc., is inexcusable in any man."—SCIENTIFIC AMERICAN. "A valuable addition to any library."—N. Y. SUN. "There is more real worth than in most books at ten times the cost."—N. Y. COMMERCIAL WORLD. Note the price, **$1.00,** post-paid; 2 copies for **$1.75.**

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For a **Club of 15** we will send free a Solid Silver Hunting Case Watch.
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WORLD MANUFACTURING CO. November 21st, 1882.

Find enclosed $30 for 30 New American Dictionaries and the Ladies' Solid Gold Watch. I secured Thirty Subscribers in one day, and have several more promised. Everyone likes the Dictionary and all I have seen have subscribed.

Miss LAURA COIL, Annapolis, Mo.

Office of the Auditor of the Treasury, Post Office Department.
World Manuf'g Co., Washington, D. C., Jan. 29, 1883.

The New American Dictionary ordered January 15 at hand. I obtained fourteen subscribers in about as many minutes last Saturday, and find the Post Office department is a good field to work in. The book proves to be just the thing for office use. I have many more promised, and will send another larger order. Send the silver Watch as premium for this club.

[HUNDREDS OF TESTIMONIALS LIKE THE ABOVE] **Respectfully, ROBERT H. WOOD.**

TESTIMONIALS.

World Manufacturing Co., Jan. 19, 1883.

Gentlemen—Enclosed find fifty dollars, for which please send fifty New American Dictionaries and premiums, two ten dollar Aluminum Gold Watches. The premium Watch I received with the last club of Dictionaries gives good satisfaction. Will send more orders in a few days.

Yours truly, CHARLES McCOY, Ozark, Christian Co., Mo.

World Manufacturing Co., Jan. 19, 1883.

Enclosed you will find the money for a club of fifteen Dictionaries, and the coin silver Watch. I am a poor boy, and only eleven years old. My parents could not afford to buy me a Watch, I thought I would earn the Watch myself by getting up a club for your New American Dictionary, and have succeeded. Send at once and oblige,

Yours respectfully, MARTIN M. KELLER, Centre Hall, Centre Co., Pa.

World Manufacturing Co., Jan. 15, 1883.

I got my Dictionary last Saturday noon, and got up a club of fifteen before night. I enclose fifteen dollars for 15 New American Dictionaries and the silver Watch. Send soon as you can conveniently. I will continue to canvass and send you more orders.

Respectfully yours, J. K. HOFF, Congress, Ohio.

World Manufacturing Co., Jan. 16, 1883.

I enclose Post Office order, $24.00, for seventeen New American Dictionaries and five Bible Dictionaries, which please forward at once with the premium, ten dollar Watch. Am still getting orders, and will send for another lot soon.

Yours in haste, JOHN P. HAGAN (Teacher), Sherbrooke, Nova Scotia.

World Manufacturing Co., Jan. 11, 1883.

Gentlemen—Find enclosed the cash for fifty New American Dictionaries, same as last lot bought from you. Send by Adams Express.

Yours truly, C. C. KINNISON, Rural Dale, Ohio.

World Manufacturing Co., Jan. 26, 1883.

Enclosed find ten dollars for New American Dictionaries. Send mohair dress pattern for premium. Will send you another order soon.

Yours respectfully, W. J. PERRY, Griggsville, Ill.

World Manufacturing Co., Jan. 26, 1883.

Gents—The New American Dictionary is at hand and gives perfect satisfaction. Enclose twelve dollars for twelve copies, and want the Organette as premium. I want to become your agent for this section, so send this order at once.

Respectfully, W. W. JOHNSTON, Bennett's Station, Texas.

World Manufacturing Co., Jan. 10, 1883.

Dear Sirs—I enclose the cash for 100 New American Dictionaries, which please send at once. Send Gents' solid gold watch and the twenty dollar gold piece as premiums.

Yours truly, J. C. TUDOR, 21 Striker Street, Baltimore, Md.

World Manufacturing Co., Jan. 30, 1883.

Dear Sirs—I again went to work, and in the little spare time I have had, have secured 100 new subscribers for the New American Dictionary, which please ship as before. The gold Watch which I received with the last lot proves satisfactory. Will take the cash commission instead of premium for this order. Send soon as possible, and oblige

J. C. TUDOR, Baltimore, Md.

World Manufacturing Co., Jan. 1, 1883.

Enclosed find money order for 41 New American Dictionaries and premiums as named below. - - - Please let me know if you will give me a cash commission. Will send you another order soon.

Respectfully, W. S. DIEFFENBACHER, Jersey Shore, Lyconing Co., Pa.

World Manufacturing Co., Jan. 26, 1883.

I received the books a few days since, and my wife is very much pleased with the Watch. The Dictionaries give entire satisfaction. I did not order half enough. I enclose the cash for one hundred New American Dictionaries, which please forward soon as possible, so I may not disappoint my subscribers.

Respectfully, W. S. DIEFFENBACHER, Jersey Shore, Lyconing Co., Pa.

World Manufacturing Co., Jan. 26, 1883.

I hereby acknowledge receipt of Dictionaries and premium Watch, both entirely satisfactory and as represented. What can you sell me the Dictionaries for without premiums?

Yours truly, H. S. GILMAN, Post Mills, Vermont.

TESTIMONIALS.

World Manufacturing Co., Jan. 29, 1883.

I have sold the 100 New American Dictionaries. Will you send me 50 at 100 rates, as it is more convenient?

Respectfully, NORMAN WEBBER, Lubec, Maine.

World Manufacturing Co., Jan. 27, 1883.

I received the New American Dictionary, and am much pleased with it. Enclosed find order for fifteen more, and the premium Watch. The Dictionary examined is the best advertisement it can have.

BENJ. F. JENKINS, Cromwell, Ohio Co., Ky.

World Manufacturing Co., Jan. 31, 1883.

I received the Dictionary, and find it as advertised—a good book. I enclose $15 for fifteen Dictionaries and the premium silver Watch. I got up this club very easy, and am getting up another club.

Yours respectfully, C. S. HINKLEY, Jonesport, Maine.

World Manufacturing Co., Jan. 30, 1883.

I here enclose $30 for New American Dictionaries. I made this club last week, and have more subscribers toward a new club. Send the gold watch as premium for this club. I am doing a good business with your books, and will send another order soon.

Respectfully, J. J. ROBERTS, Steel Works, South Pueblo, Colorado.

OTHER TESTIMONIALS.

OFFICE OF THE AUDITOR OF THE TREASURY, POST-OFFICE DEPARTMENT, WASHINGTON, D. C., Jan. 29, 1883.

World Manufacturing Co.:

The New American Dictionary ordered January 15, at hand. I obtained fourteen subscribers in about as many minutes last Saturday, and find the Post-Office department is a good field to work in. The book proves to be just the thing for office use. I have many more promised, and will send another larger order. Send the silver watch as premium for this club. Respectfully,

ROBERT H. WOOD.

World Manufacturing Co.: JAN. 12, 1883.

The New American Dictionary is all right and worth the money. I inclose $15 for a club of fifteen, and want the silver watch for premium. I will get up more clubs soon. Respectfully,

GEORGE WOOD, Millview, Pa.

World Manufacturing Co.: JAN. 25, 1883.

Have delivered all the Dictionaries, and more called for. Please send 13 more at once. Will continue to work for you this winter and spring.

Yours, J. H. ELLIS, Princeton, Ill.

World Manufacturing Co.: JAN. 24, 1883.

I have secured a club of 30 for your New American Dictionaries, and inclose the money for the same. Please send the ladies' gold watch for premium. If it proves satisfactory I will get up a club of 60, for a stem-winding gold watch for my husband. Respectfully,

MRS. DR. G. W. FISHER, Lake City, Mich.

World Manufacturing Co.: JAN. 29, 1883.

The New American Dictionary received in due time, and I found it much better than I expected. I took a little pains to show it to my neighbors, and got a club of 15 in a short time. Find inclosed $15 for them, and please send the solid silver watch as premium. I think I can get a young man to canvass this section for you. Yours respectfully,

IRA R. HALL, Randolph, Pa.

World Manufacturing Co.: JAN. 25, 1883.

The New American Dictionary at hand. Have completed a club of 15, and inclose Post-Office order for $15, and want the silver watch for premium. I am getting up a club of 30 to secure the ladies' gold watch.

Respectfully yours, B. W. BECKS, Palatka, Fla.

World Manufacturing Co.: JAN. 26, 1883.

I have taken 15 subscribers for the New American Dictionary, and inclose the amount required. Please send at once. The books sell readily, and I will send you a larger club next time.

Yours truly, FRANK ENGLISH, Salem, Ohio.

World Manufacturing Co.: JAN. 27, 1883.

Dear Sir—I send you $15 for fifteen more Dictionaries and premium as promised. Please forward the goods at once and oblige,

ROYAL PHILLIPS, Oskaloosa, Iowa.

World Manufacturing Co.: JAN. 22, 1883.

Gentlemen—I inclose $30 for thirty Dictionaries. Will take the double-barrelled shot gun premium. Please send at once and oblige,

Yours respectfully, ANDREW HELMAN, Winfield, Kansas.

World Manufacturing Co.: JAN. 25, 1883.

Sirs—Inclosed find $30 for thirty New American Dictionaries and the gold watch as premium. Send soon as possible.

Yours truly, MRS. ELIZABETH C. COATS, Fulton, N. Y.

World Manufacturing Co.: JAN. 29, 1883.

Inclosed find $20 for twenty New American Dictionaries. I will take the New American Lever Watch for my premium. This is my second order, and I am getting up a club now. Yours truly,

MOSES M. ROBINSON, Manlius Village, N. Y.

World Manufacturing Co.: JAN. 31, 1883.

Gents—I have completed a club of 50 for the New American Dictionary, and inclose the cash; please send as premium the watch as promised. I have a large personal acquaintance, and can sell many more Dictionaries, which I propose to do. May take a watch for my wife for my next premium.

Yours truly, E. R. F. HART, 210 Clybourne Place, Chicago, Ill.

The above are samples of the many testimonials received.

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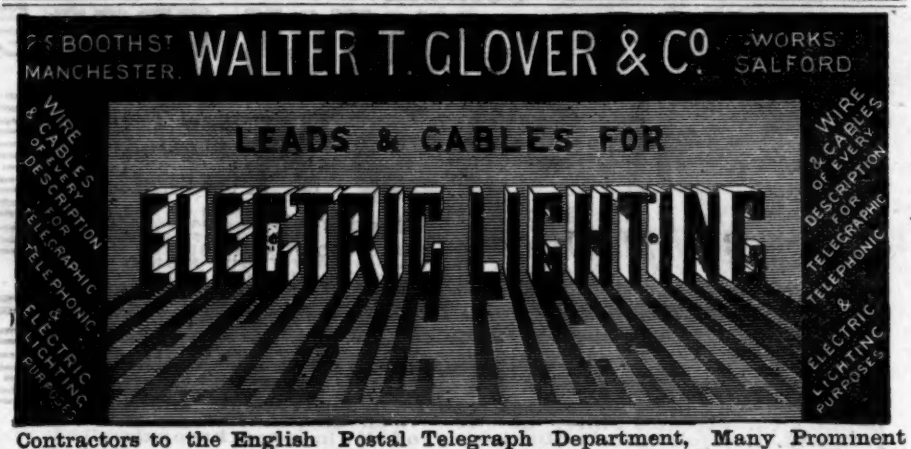
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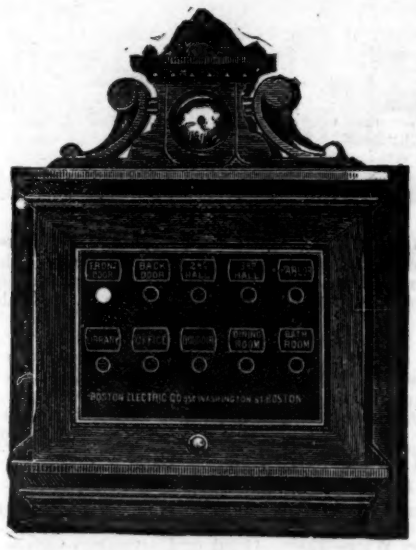

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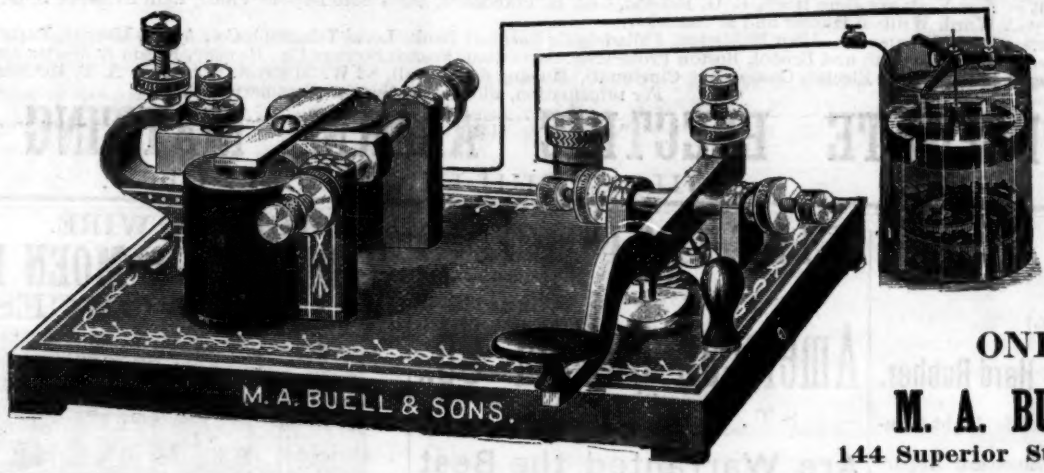

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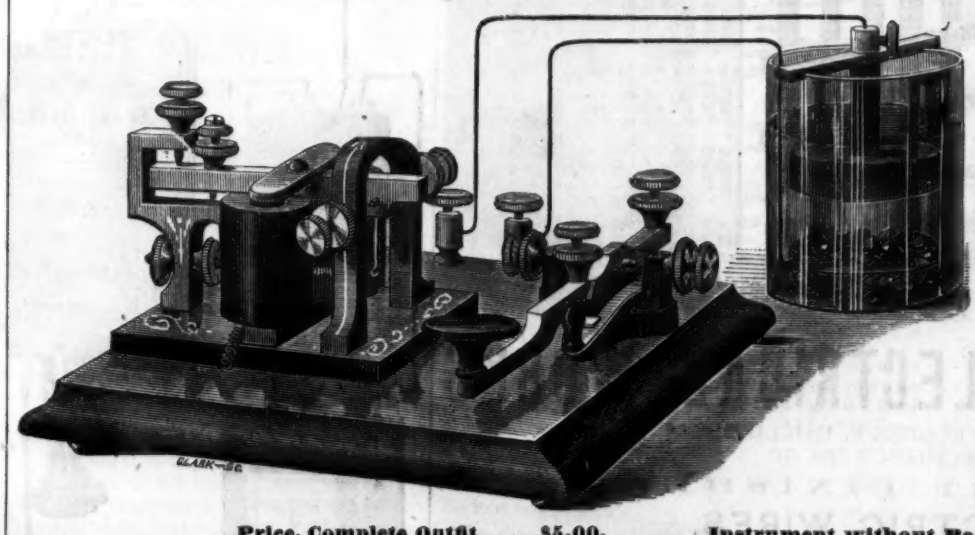

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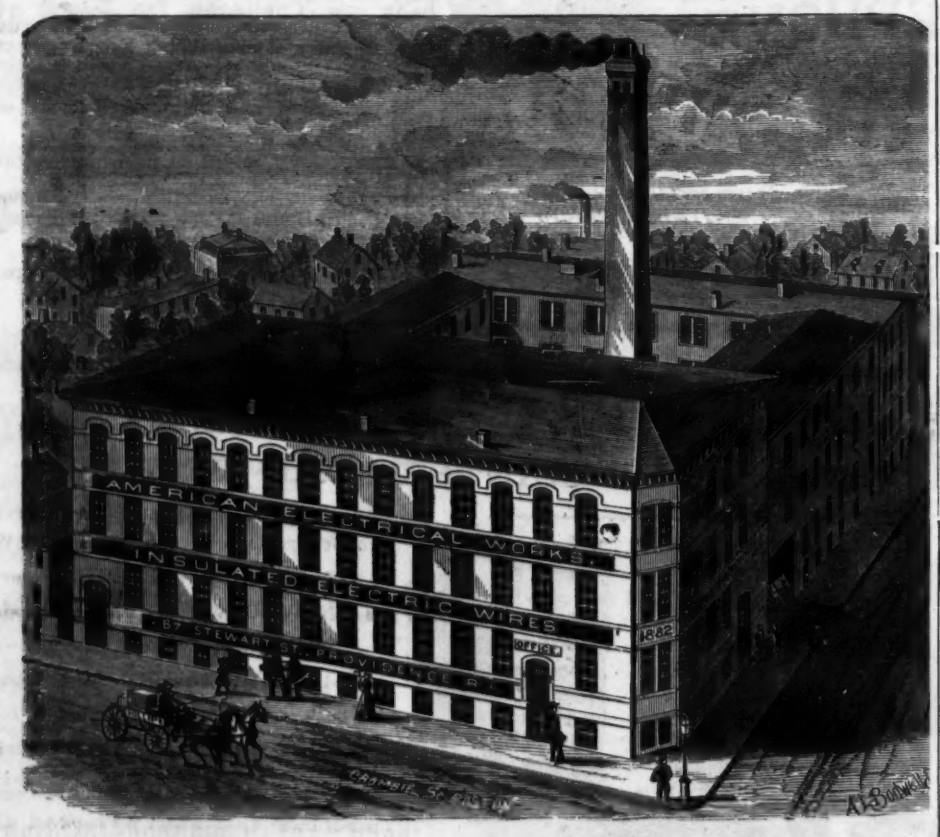

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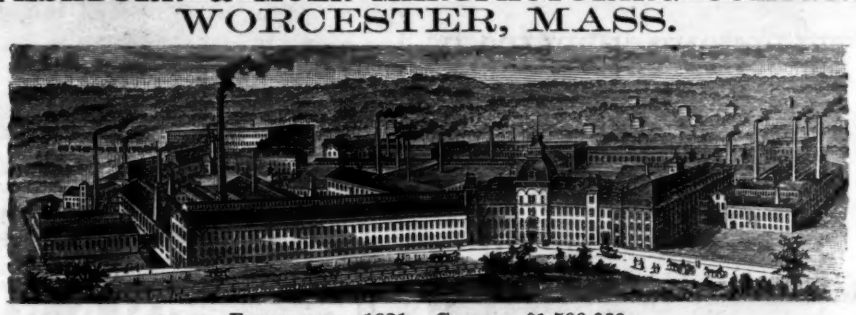

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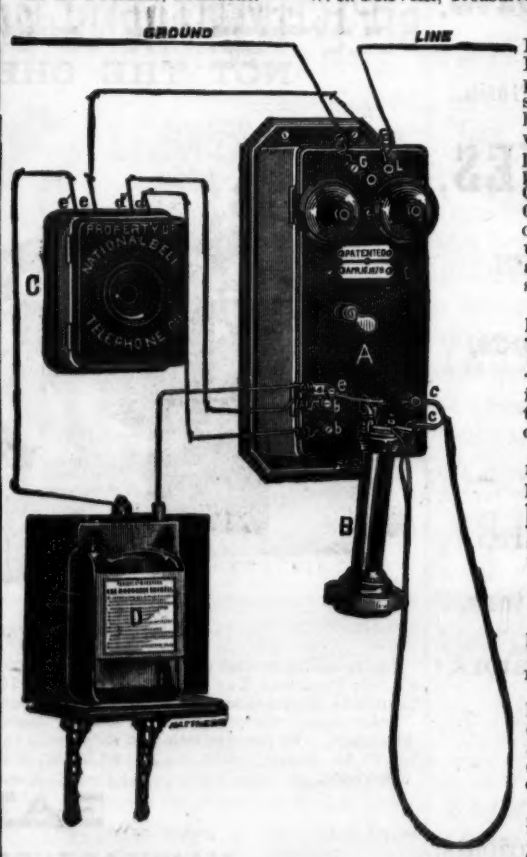

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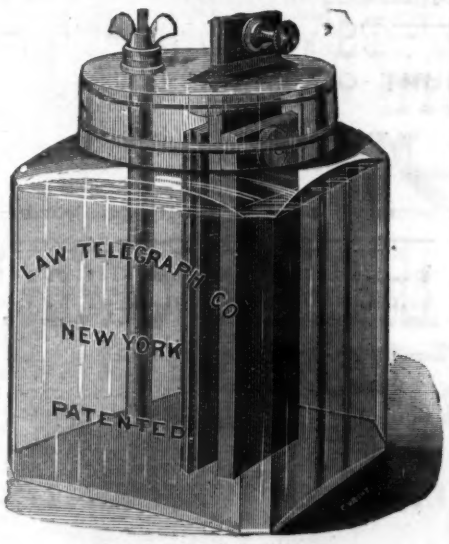

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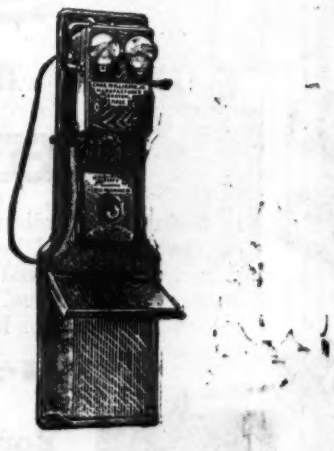

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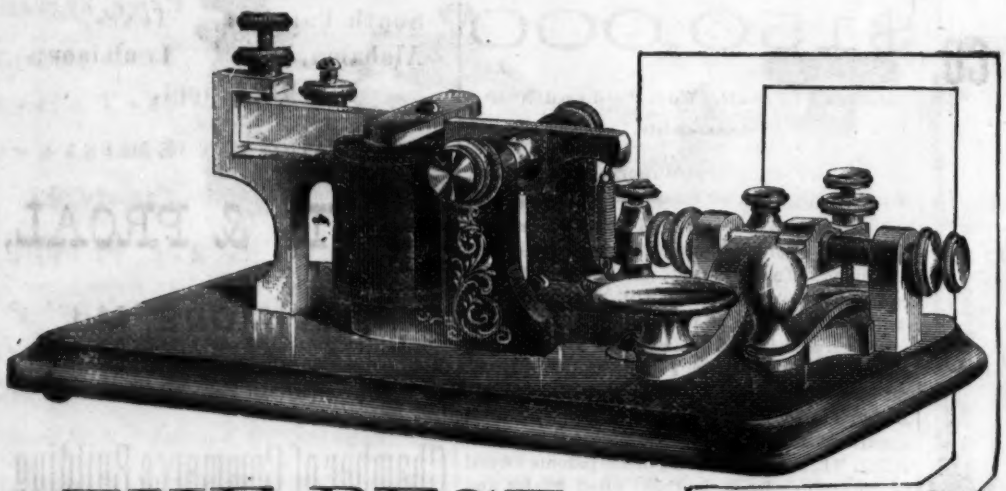

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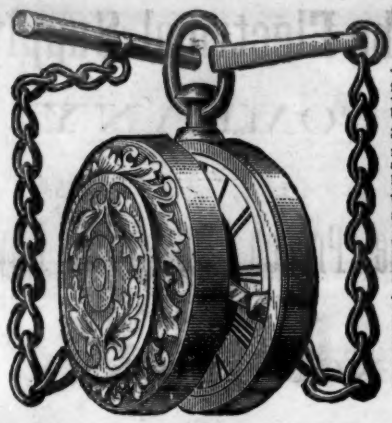

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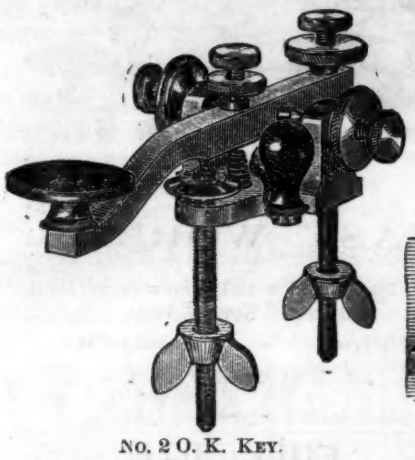

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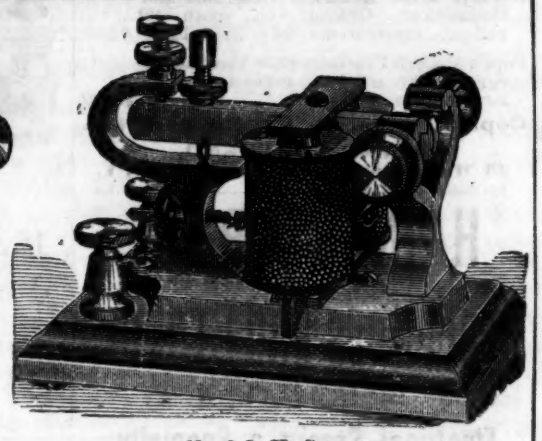

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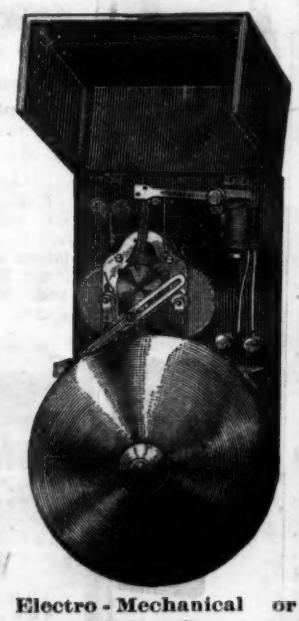

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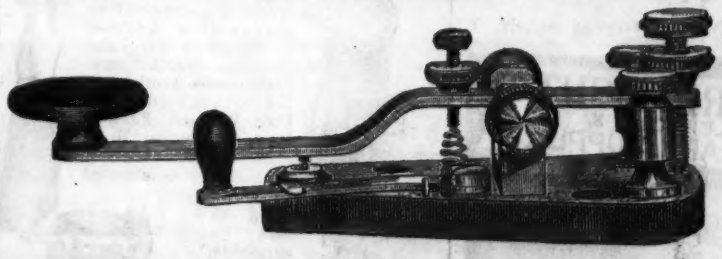

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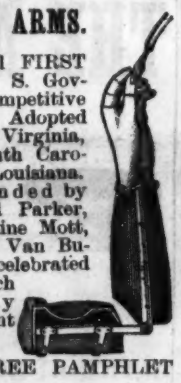

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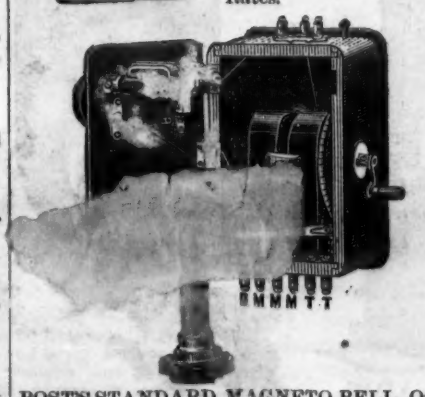

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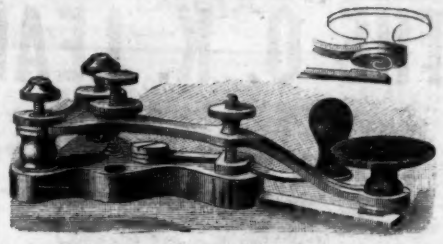

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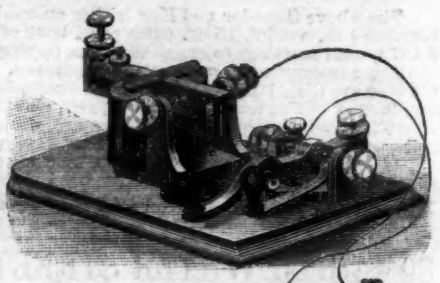

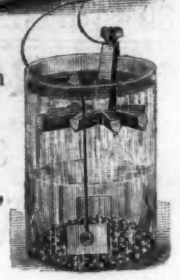

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